VPDES PERMIT FACT SHEET

This document gives pertinent information concerning the reissuance of the VPDES permit listed below. This permit is being processed as a major, municipal permit. The effluent limitations contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260 et seq. The discharge results from the operation of a publicly owned municipal wastewater treatment plant. This permit action consists of updating the permit to reflect agency policies and procedures. SIC Code: 4952.

1. Facility Name and Address: Henrico County Water Reclamation Facility (WRF)
   9101 WRVA Road
   Henrico, Virginia 23231
   Henrico County

2. Permit No. VA0063690 Permit Expiration Date: December 1, 2010

3. Owner: County of Henrico
   Contact Name: James Grandstaff
   Title: Division Director, Water Reclamation Facility
   Telephone No.: 804-795-9302
   Address: 9101 WRVA Road, Henrico, Virginia 23231

4. Application Complete Date: June 14, 2010
   Permit Drafted By: Jaime Bauer
   DEQ Regional Office: Piedmont Regional Office

   Reviewed By: Janine Howard Date: June 30, 2011
   Curt Linderman Date: November 16, 2011
   Kyle Winter Date: March 1, 2012

5. Receiving Stream:
   Name: James River
   River Mile: 2-JMS094.58
   Basin: James River Basin
   Subbasin: James River Basin (Lower)
   Section: 1
   Class: II
   Special Standards: None
   Tidal – Flow Frequencies cannot be determined
   On 303(d) list? Yes

   See Flow Frequency Analysis (**Attachment 1**).

6. Operator License Requirements: The recommended attendance hours by a licensed operator and the minimum daily hours that the treatment works should be manned by operating staff are contained in the Sewage Collection and Treatment Regulations (SCAT) 9 VAC 25-790 et seq. A Class I licensed operator is required for the facility.

7. Reliability Class: Reliability is a measurement of the ability of a component or system to perform its designated function without failure or interruption of service. The reliability classification is based on the water quality and public health consequences of a component or system failure. The permittee is required to maintain Class I Reliability for the proposed facility.

8. Permit Characterization:
   ( ) Private ( ) Federal ( ) State (X) POTW ( ) PVOTW

   ( ) Possible Interstate Effect ( ) Interim Limits In Other Documents

9. Table 1: Wastewater Flow and Treatment:

Outfall Number	Wastewater Source	Treatment	Flow
001	Residential, commercial and industrial (~15 industrial users) wastewater from the counties of Henrico, Hanover, and Goochland	Wastewater: Screening (bar rack), grit removal, primary clarification, activated sludge, Enhanced Biological Nutrient Removal (ENR), secondary clarification, filtration, and chlorination/dechlorination. Sludge: Anaerobic digestion, gravity belt thickening, dewatering centrifuges, and land application.	75.0 MGD design capacity

See **Attachment 2** for a facility diagram and historical timeline.

10. Sludge Disposal: Henrico County currently contracts Nutri-Blend, Inc. to land apply sludge generated by the facility (Pollutant Concentration (PC) Sewage Sludge). The sludge meets Class B pathogen reduction. Additionally, Nutri-Blend occasionally landfills some sludge if necessary.

11. Discharge Location Description: This facility discharges to the James River under the Enon Bridge near Dutch Gap, VA. Name of USGS topo map: Dutch Gap (See **Attachment 3)**

12. Material Storage: The POTW employs and stores a variety of chemicals in the treatment process. Some regularly utilized and stored chemicals include sodium hydroxide, various polymers, aluminum sulfate, sodium hypochlorite, and sodium bisulfite. These chemicals are stored in buildings with appropriate spill containment. See **Attachment 4** for a comprehensive list of chemicals stored on site. The dewatered, digested sludge is stored on a concrete pad. The covered portion of the storage pad allows for approximately 156-days of dry storage. Runoff from portions of the concrete pad not under roof is routed into the excess flow basins.

13. Ambient Water Quality Information: Senior planning staff recommended the use of ambient water quality data (**Attachment 5)** from monitoring station 2-JMS094.96 located on the James River near Buoy 150, approximately 0.4 miles upstream of the outfall. Hardness data is not available from this station; therefore, hardness data from 2-JMS099.30, approximately 4.7 miles upstream of the outfall at Buoy 157, is being used.

14. Antidegradation Review and Comments: Tier 1 _X_ Tier 2 __ Tier 3 __

The State Water Control Board's Water Quality Standards includes an antidegradation policy (9 VAC 25-260-30). All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect those uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The receiving stream, James River, is determined to be a Tier 1 waterbody. The Richmond-Crater Water Quality Management Plan fully allocates $cBOD_5$ and ammonia to multiple dischargers in the segment for the purpose of limiting adverse effects to ambient dissolved oxygen and ammonia concentrations and maintain a minimum dissolved oxygen concentration of 5.0 mg/L. Since at the

time the plan was developed, the dissolved oxygen standard was 5.0 mg/L, the river has been considered a Tier 1 water. Also see TMDL discussion in item # 26 below.

15. Site Inspection: Performed By: Charlie Stitzer Date: March 2, 2011 (**Attachment 6**).

16. Effluent Screening:

Effluent Data
See **Attachment 7** for effluent data submitted with the permit reissuance application and obtained from DMRs.

Richmond Crater Water Quality Management Plan
As previously mentioned, the Richmond Crater Water Quality Management Plan allocates load limitations of $cBOD_5$ and ammonia to multiple dischargers on this segment of the James River to limit the adverse effects to ambient dissolved oxygen concentrations and to maintain a minimum dissolved oxygen concentration of 5.6 mg/L. Henrico WRF (listed as Henrico STP in the Plan) was allocated wasteloads based on a design flow of 38.07 MGD when the plan was established. Since that time, the Henrico WRF has expanded to 75.0 MGD. While the wasteload allocations of $cBOD_5$ and ammonia remain unchanged, the expanded flow results in a change in concentration of these parameters. Table 1 below summarizes the wasteload allocations based on the Richmond Crater Water Quality Management Plan as well as the concentration limits based on the 75.0 design flow.

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Table 1: Ammonia and $cBOD_5$ Calculations Based 1989 Richmond Crater Interim Water Quality Management Plan

		Monthly			Weekly	
		lb/d[1]	kg/d	mg/L @75.0 MGD	mg/L @75.0 MGD	kg/d
$cBOD_5$	Summer	3002	1361	5	7	2044
	Winter	4756	2157	8	11	3236
NH_3[2]	Summer	2403	1090	3.84	5.76	1635
	Winter	3504	1589	5.60	8.40	2384
DO	Summer	-	-	5.6	-	-
	Winter	-	-	5.6	-	-

[1] Wasteload allocations are from Richmond Crater Interim Water Quality Management Plan based on 38.07 MGD (**Attachment 8).**
[2] The Richmond Crater Interim Water Quality Management Plan lists the winter ammonia concentration limitation as a value with 3 significant digits and the summer concentration limitation in 2 significant digits. However, calculated concentration limitations are being expressed as three significant digits for summer and winter seasonal limitations in accordance with the Rules of Precision, the use of a design flow with three significant figures, and the chronic ammonia water quality standard.
[3] The $cBOD_5$ concentration limitations are expressed as one significant digit in accordance with GM06-2016 Amendment 1 which states "For BOD, the method is not accurate enough to provide data beyond a whole number."

Data Analysis & Reasonable Potential Evaluation

In order to calculate the wasteload allocations for each of the toxic parameters, receiving stream, mixing, and effluent data are entered into the MSTRANTI.xls spreadsheet. Based on this information, acute and chronic wasteload allocations are calculated. As mentioned previously, ambient stream data is based on monitoring station 2-JMS094.96 and 2-JMS099.30 (hardness). Because the discharge is to a tidal segment of the river, dilution ratios are used instead of stream flows. A memorandum dated June 22, 1999 from M. Dale Phillips documents the results of a

CORMIX run for the discharge from Henrico County WRF (**Attachment 9)**. Based on a design flow of 75 MGD, dilution ratios of 3:1 (acute) and 8:1 (chronic) were recommended. *(Note: The acute ratio represents 2 parts stream plus one part effluent for three total parts. Likewise, the chronic ratio represents 7 parts stream to one part effluent for eight total parts.)* The MSTRANTI Excel Spreadsheet was used to calculate acute and chronic WLAs using these dilution ratios.

The WLAs are entered in to the STATS.exe statistical software application along with concentration values of parameters known or believed to be present in the facility's effluent based on monthly and application monitoring data to evaluate the need for permit limitation and calculate the limitation. Those parameters are summarized in Table 2 below along with the projected wasteload allocation from MSTRANTI that are necessary to protect water quality of the receiving stream. Included in **Attachment 10** are the effluent limitation development documents including the MSTRANTI data source table, MSTRANTI spreadsheet of WLAs, and STATS.exe analyses for the appropriate parameters.

Table 2: Analyses of Parameters Known or Believed Present in Effluent

Parameters (Units)	Reported Concentration	WLA_a	WLA_c	Human Health	Limit Needed?
Ammonia (mg/L)	2.75	43	7.4	--	Yes
Total Residual Chlorine (µg/L)	<100	57	88	--	Yes
Acrylonitrile (µg/L)	<50 (06/2009) <10 (01/2010) <10 (02/2010)	--	--	20	No
Chlorides (µg/L)	48,000	2,600,000	1,800,000	--	No
Hydrogen Sulfide (µg/L)	492	--	16	--	Yes

A default data value of 9.00 mg/L is used in place of effluent data for ammonia in accordance with DEQ Guidance Memo No. 00-2011. Ammonia is known to be present in domestic effluents and thus a reasonable potential exists for any domestic facility to cause or contribute to a violation of the VA Water Quality Standards. Based on this analysis, the weekly and monthly average ammonia limitations necessary to protect ambient water quality of the receiving stream are 9.11 mg/L and 14.9 mg/L, respectively. These limitations are less stringent than the ammonia concentrations calculated using the allocations in the Richmond Crater Water Quality Management Plan. Therefore, the limitations from the Plan will be carried forward in accordance with the agency anti-backsliding policy.

Also in accordance with DEQ Guidance Memo No. 00-2011, a default value of 20,000 µg/L is used in place of effluent data for total residual chlorine (TRC) when the method of disinfection used is chlorination. The evaluation indicated the need for TRC limitations of 28 µg/L (monthly) and 35 µg/L (weekly). These are the same concentration limitations for TRC established in previously issued permits, and therefore, no change in limitations is necessary for TRC.

In the permit application, the permittee reported acrylonitrile in the effluent at an average concentration of <20 µg/L and a maximum concentration of 50 µg/L. This data was based on three samples collected in 2009 and 2010 as listed in Table 2 above. There are no acute or chronic criteria for acrylonitrile in the Water Quality Standards; therefore, acute and chronic wasteload allocations cannot be calculated. The reported values were compared to the Human Health Criterion of 20 µg/L. The June 2009 reported value does not indicate if effluent concentrations are less than the human health criteria because the quantification level used for that test is greater than the criteria. The reported concentrations from January 2010 and February 2010 indicate that the effluent concentration of acrylonitrile is less than the human health criteria. Therefore, no limitation is required.

Additionally, the permittee reported a measureable concentration of total recoverable zinc in the Form 2A application Part D. The freshwater aquatic life Water Quality criteria for metals are expressed in the dissolved form, with the exception of selenium. Therefore, total recoverable metals data are not used to establish permit limitations. The permittee also submitted dissolved zinc data indicating that effluent concentrations are less than agency established quantification levels. No further analysis of the zinc was performed.

The permittee reported the presence of hydrogen sulfide in the effluent at a concentration of 492 µg/L. Analysis of the data in STATS.exe indicates that a limitation for hydrogen sulfide is necessary to protect water quality. Through a conversion method, the data were initially used to attempt to assess potential hydrogen sulfide levels in the effluent. However, the accuracy and precision of using total sulfide results for developing limitations for hydrogen sulfide has recently come under question. According to Standard Methods, the unionized H_2S "can be calculated from the concentration of dissolved sulfide, the sample pH, and the conditional ionization constant of H_2S." Based on the above, it now appears to be more appropriate to specify that results be reported as dissolved sulfide. To provide data to evaluate the potential presence of H_2S and need for a limit, dissolved sulfide monitoring is required once per six months by grab sample for this permit re-issuance.

The Richmond Crater Water Quality Management Plan established a minimum dissolved oxygen (DO) concentration of equal to or greater than 5.6 mg/L. This limitation is carried forward from previous VPDES permits with no change.

Total phosphorus and total nitrogen annual average concentration limitations are applicable to the effluent discharge following completion of the nutrient upgrade project and receipt of the CTO for the project dated July 25, 2011 (**Attachment 14**). These technology based concentration limitations will become effective on January 1, 2013. Compliance with these concentration limitations will ensure conformance with the annual total nitrogen and total phosphorus wasteload allocations as assigned in the Water Quality Management Planning Regulation (9 VAC25-720-60.C) for the facility at a design capacity of 75.0 MGD without the need for offsets. All nutrient parameter limitations and associated monitoring were revised or included in accordance with the applicable guidance memorandum (Guidance Memorandum 07-2008, Amendment 2). The total phosphorus concentration limitation of 2.0 mg/L was previously applied to the facility based on nutrient enriched water special standards as listed in the Virginia Water Quality Standards. The 2.0 mg/L limitation will remain effective until December 31, 2012 at which time the final technology based phosphorus concentration limitation of 0.5 mg/L becomes effective.

Total Suspended Solids (TSS) limitations are based on best engineering judgment and are carried forward from previous VPDES permits with no change.

Table 3: Permit Limitations and Basis

PARAMETER		BASIS FOR LIMITS	DISCHARGE LIMITS					
			MONTHLY AVERAGE		WEEKLY AVERAGE		MIN	MAX
Flow (MGD)		NA	NL – monitoring only				NA	NL
pH (standard units)		2	NA		NA		6.0 S.U.	9.0 S.U.
$cBOD_5$	June – October	4	5 mg/L	1361 kg/d	7 mg/L	2044 kg/d	NA	NA
	November – May	4	8 mg/L	2157 kg/d	11 mg/L	3236 kg/d	NA	NA
Total Suspended Solids (TSS)		3	8.0 mg/L	2300 kg/d	12 mg/L	3400 kg/d	NA	NA
Ammonia as N	June – October	4	3.84 mg/L	1090 kg/d	5.76 mg/L	1635 kg/d	NA	NA
	November – May	4	5.60 mg/L	1589 kg/d	8.40 mg/L	2385 kg/d	NA	NA

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITS			
		MONTHLY AVERAGE	WEEKLY AVERAGE	MIN	MAX
Total Phosphorus – Monthly Average	5	2.0 mg/L	NA	NA	NA
Total Phosphorus Annual Average	5	0.5 mg/L	NA	NA	NA
Total Nitrogen – Annual Average	5	5.0 mg/L	NA	NA	NA
Total Phosphorus (as P) – Year to Date	5	NL – monitoring only		NA	NA
Total Nitrogen – Year to Date	5	NL – monitoring only		NA	NA
Dissolved Oxygen	4	NA	NA	5.6 mg/L	NA
Total Residual Chlorine (TRC)	1	28 µg/L	35 µg/L	NA	NA
*TRC Contact (Parameter 157)	3	NA	NA	1.0 mg/L	NA
*TRC Contact (Parameter 213)	3	NA	NA	0.60 mg/L	NA
E.coli	2	126 N/100 mL (geometric mean)	NA	NA	NA
Dissolved Sulfide	3	NL – monitoring only		NA	NL

1. Water Quality Based Effluent Limitation
2. Water Quality Standards – 9VAC25-260-50 eff. 1/6/2011
3. Best Engineering Judgment (BEJ)
4. Richmond Crater Water Quality Management Plan
5. Nutrient Regulations and DEQ Related Guidance

* Samples are taken prior to dechlorination.

17. **Basis for Sludge Use & Disposal Requirements:** Henrico County contracts with Nutri-Blend, Inc. to land apply the sludge generated by the facility. The sludge meets Class B pathogen reduction. Applicable sludge requirements are addressed by the facilities that receive the sludge.

18. **Antibacksliding:** The 2005 permit contained a bacteria limitation in terms of fecal coliform based on the bacterial Water Quality Standards at the time of permit issuance. With this 2012 permit reissuance, an *E. coli* limitation is replacing the fecal coliform limitation. The Water Quality Standards have been revised to establish bacterial standards for freshwater systems in terms of *E. coli.* Removal of the fecal coliform limitations does not constitute backsliding because *E. coli* is a subset of fecal coliform and more accurately depicts the type of bacterial that may have detrimental effects on human health.

    All other limitations are the same or more stringent than limitations in the previous permit.

19. **Compliance Schedules:** Compliance schedules are not applicable to the permit reissuance.

20. **Special Conditions**

    Part I.B. Additional Total Residual Chlorine (TRC) Limitations and Monitoring Requirements
    Rationale: Required by Sewage Collection and Treatment Regulations, 9VAC25-790, and Virginia Water Quality Standards 9VAC25-260-170, Bacteria; other recreational waters. Also, 40 CFR 122.41(e) requires the permittee, at all times, to properly operate and maintain all facilities and systems of treatment in order to comply with the permit. This ensures proper operation of chlorination equipment to maintain adequate disinfection.

    Part I.C.1: 95% Capacity Reopener
    Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-200 B.4 for all POTW and PVOTW permits.

    Part I.C.2: Indirect Dischargers
    Rationale: Required by VPDES Permit Regulation, 9VAC25-31-200 B 1 and B 2 for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

Part I.C.3: Operations and Maintenance Manual Requirement
Rationale: Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790; VPDES Permit Regulation, 9 VAC 25-31-190 E.

Part I.C.4: Licensed Operator Requirement
Rationale: The VPDES Permit Regulation, 9 VAC 25-31-200 C and the Code of Virginia § 54.1-2300 et seq., Rules and Regulations for Waterworks and Wastewater Works Operators (18 VAC 160-20-10 et seq.), require licensure of operators.

Part I.C.5: Reliability Class
Rationale: Required by Sewage Collection and Treatment Regulations, 9 VAC 25-790 for all municipal facilities.

Part I.C.6: Sludge Use and Disposal
Rationale: VPDES Permit Regulation, 9VAC25-31-100 P; 220 B 2; and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal.

Part I.C.7: Sludge Reopener
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-220 C for all permits issued to treatment works treating domestic sewage.

Part I.C.8: Compliance Reporting
Rationale: Authorized by VPDES Permit Regulation, 9 VAC 25-31-190 J 4 and 220 I. This condition is necessary when pollutants are monitored by the permittee and a maximum level of quantification and/or a specific analytical method is required in order to assess compliance with a permit limitation or to compare effluent quality with a numeric criterion.

The Quantification Levels (QLs) given for TSS, TRC, ammonia (as N) and dissolved sulfide are standard Agency prescribe QLs used to identify the quantifiable concentration of a particular pollutant in an effluent (Guidance Memo 10-2003). The $cBOD_5$ QL of 2 mg/L is being included for consistency with recently adopted VPDES General Permit regulations and is necessary to ensure compliance with the permit limitations.

Part I.C.9: Materials Storage and Handling
Rationale: 9 VAC 25-31-50 A prohibits the discharge of any wastes into State waters unless authorized by permit. Code of Virginia §62.1-44.16 and 62.1-44.17 authorizes the Board to regulate the discharge of industrial waste or other waste.

Part I.C.10: CTC, CTO Requirement
Rationale: Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790. 9 VAC 25-40-70 A authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade.

Part I.C.11: Reopeners
Rationale:
a. Section 303(d) of the Clean Water Act requires that total maximum daily loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL approved for the receiving stream. The re-opener recognizes that, according to section 402(o)(1) of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in this permit. Specifically, they can be relaxed it they are the result of a TMDL, basin plan, or other wasteload allocation prepared under section 303 of the Act.
b. 9 VAC 25-40-70 A authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade.

c. 9 VAC 25-31-390 A authorizes DEQ to modify VPDES permits to promulgate amended water quality standards.

Part I.C.12: Facility Closure
Rationale: Code of Virginia § 62.1-44.19 of the State Water Control Law. This condition establishes the requirement to submit a closure plan for the wastewater treatment facility if the treatment facility is being replaced or is expected to close.

Part I.C.13: Nutrient Reporting Calculations
Rationale: §62.1-44.19:13 of the Code of Virginia defines how annual nutrient loads are to be calculated; this definition is carried forward in 9 VAC 25-820-70. As annual concentrations (as opposed to loads) are limited in the individual permit, this special condition is intended to reconcile the reporting calculations between the permit programs, as the permittee is collecting a single set of samples for the purpose of ascertaining compliance with two permits.

Part I.C.14: Suspension of Annual Average Concentration Limitations for E3/E4 Facilities
Rationale: 9 VAC 25-40-70 B authorizes DEQ to approve an alternate compliance method to the technology-based effluent concentration limitations as required by subsection A of this section. Such alternate compliance method shall be incorporated into the permit of an Exemplary Environmental Enterprise (E3) facility or an Extraordinary Environmental Enterprise (E4) facility to allow the suspension of applicable technology-based effluent concentration limitations during the period the E3 or E4 facility has a fully implemented environmental management system that includes operation of installed nutrient removal technologies at the treatment efficiency levels for which they were designed.

Part I.D. Pretreatment Program
Rationale: VPDES Permit Regulation, 9 VAC 25-31-730 through 900, and 40 CFR Part 403 require certain existing and new sources of pollution to meet specified regulations.

Part I.E: Whole Effluent Toxicity (WET) Monitoring Program
Rationale: VPDES Permit Regulation, 9 VAC 25-31-210 and 220 I, requires monitoring in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act. See **Attachment 11** for the WET evaluation.

Part I.F and Part I.G—Record Keeping Special Conditions for Land Application of Sewage Sludge and Reporting Requirements for Land Application for Sewage Sludge
Rationale: VPDES Permit Regulation, 9VAC 25-31-580 and 590 requires record keeping and reporting to provide for and assure compliance with all applicable requirements listed in the permit.

Part II, Conditions Applicable to All VPDES Permits
The VPDES Permit Regulation at 9 VAC 25-31-190 requires all VPDES permits to contain or specifically cite the conditions listed.

21. Changes from 2005 Permit: The changes listed in the table below occurred during drafting of the 2012 permit.

PARAMETER	DISCHARGE LIMITS CHANGED								MONITORING REQUIREMENTS CHANGED				REASON FOR CHANGE
	MONTHLY AVG.		WEEKLY AVG.		MIN		MAX		FREQ		SAMPLE TYPE		
	From	To	From	To	From	To	From	To	From	To	From	To	
Flow (MGD)	NL	No Change	NA	No Change	NA	No Change	NL	No Change	Contin.	No Change	TIRE	No Change	NA
pH (SU)	NA	No Change	NA	No Change	6.0	No Change	9.0	No Change	1/Day	1 per Day	Grab	No Change	NA
$cBOD_5$ (Jun - Oct)	4.8 mg/L 1361 kg/d	5 mg/L 1361 kg/d	7.2 mg/L 2044 kg/d	7 mg/L 2044 kg/d	NA	No Change	NA	No Change	1/Day	1 per Week	24 HC	No Change	(1)
$cBOD_5$ (Nov – May)	7.6 mg/L 2157 kg/d	8 mg/L 2157 kg/d	11.4 mg/L 3236 kg/d	11 mg/L 3236 kg/d	NA	No Change	NA	No Change	1/Day	1 per Week	24 HC	No Change	(1)
TSS	8.0 mg/L 2271 kg/d	8.0 mg/L 2300 kg/d	12.0 mg/L 3407 kg/d	12.0 mg/L 3400 kg/d	NA	No Change	NA	No Change	1/Day	1 per Day	24 HC	No Change	(2)
Ammonia as N (Jun - Oct)	3.8 mg/L 1090 kg/d	3.84 mg/L 1090 kg/d	5.8 mg/L 1635 kg/d	5.76 mg/L 1635 kg/d	NA	No Change	NA	No Change	1/Day	1 per Day	24 HC	No Change	(3)
Ammonia as N (Nov – May)	5.6 mg/L 1589 kg/d	5.60 mg/L 1589 kg/d	8.4 mg/L 2385 kg/d	8.40 mg/L 2385 kg/d	NA	No Change	NA	No Change	1/Day	1 per Day	24 HC	No Change	(3)
Orthophosphate (as P)	NL	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	1/Week	[REMOVED]	24 HC	[REMOVED]	(4)
Total Phosphorus (as P) Interim	2.0 mg/L 568 kg/d	2.0 mg/L	NA	[NA	NA	NA	NA	NA	1/Day	1 per Day	24 HC	No Change	(9)
Total Nitrogen (as N)	NL	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	1/Week	[REMOVED]	Calculated	[REMOVED]	(4)
Total Kjehldahl Nitrogen (as N)	NL	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	1/Week	[REMOVED]	24 HC	[REMOVED]	(4)
Nitrate plus Nitrite (as N)	NL	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	1/Week	[REMOVED]	24 HC	[REMOVED]	(4)
Total Phosphorus – Monthly (kg/mo)	NA	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	NL	[REMOVED]	1/Month	[REMOVED]	Calculated	[REMOVED]	(4)
Total Phosphorus – Year to Date (kg/yr)	NA	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	NL	[REMOVED]	1/Month	[REMOVED]	Calculated	[REMOVED]	(4)

PARAMETER	DISCHARGE LIMITS CHANGED								MONITORING REQUIREMENTS CHANGED				REASON FOR CHANGE
	MONTHLY AVG.		WEEKLY AVG.		MIN		MAX		FREQ		SAMPLE TYPE		
	From	To	From	To	From	To	From	To	From	To	From	To	
Total Phosphorus – Calendar Year (kg/yr)	NA	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	51804.3	[REMOVED]	1/Year	[REMOVED]	Calculated	[REMOVED]	(4)
Total Nitrogen – Monthly (kg/mo)	NA	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	NL	[REMOVED]	1/Month	[REMOVED]	Calculated	[REMOVED]	(4)
Total Nitrogen – Year to Date (kg/yr)	NA	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	NL	[REMOVED]	1/Month	[REMOVED]	Calculated	[REMOVED]	(4)
Total Nitrogen – Calendar Year (kg/yr)	NA	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	518041.0	[REMOVED]	1/Year	[REMOVED]	Calculated	[REMOVED]	(4)
Total Phosphorus – Annual Average (mg/L) (Final)	[NEW]	0.5	[NEW]	NA	[NEW]	NA	[NEW]	NA	[NEW]	1 per Year	[NEW]	Calculated	(5)
Total Nitrogen – Annual Average (mg/L)	[NEW]	5.0	[NEW]	NA	[NEW]	NA	[NEW]	NA	[NEW]	1 per Year	[NEW]	Calculated	(5)
Total Phosphorus – Year to Date (mg/L)	[NEW]	NL	[NEW]	NA	[NEW]	NA	[NEW]	NA	[NEW]	1 per Month	[NEW]	Calculated	(5)
Total Nitrogen – Year to Date (mg/L)	[NEW]	NL	[NEW]	NA	[NEW]	NA	[NEW]	NA	[NEW]	1 per Month	[NEW]	Calculated	(5)
Total Residual Chlorine (TRC)	28 ug/L	No Change	35 ug/L	No Change	NA	No Change	NA	No Change	1/Day	1 per Day	Grab	No Change	NA
Fecal Coliform (N/100 mL)	200 Geo Mean	[REMOVED]	400 Geo Mean	[REMOVED]	NA	[REMOVED]	NA	[REMOVED]	1/Day	[REMOVED]	Grab	[REMOVED]	(6)
DO (mg/L)	NA	No Change	NA	No Change	5.6	No Change	NA	No Change	1/Day	1 per Day	Grab	No Change	No Change
E. Coli (N/100 mL)	[new]	126 Geo. Mean	[new]	NA	[new]	NA	[new]	NA	[new]	4 per month	[new]	Grab (10am -4pm)	(7)
Dissolved Sulfide	[new]	NL	[new]	NL	[new]	NA	[new]	NA	[new]	1 per 6 Months	[new]	Grab	(8)

(1) The January 27, 2010 VPDES Permit Manual (GM10-2003) establishes a sampling frequency for BOD_5 of once per week, and hence $cBOD_5$, when treatment for ammonia controls treatment for BOD. The facility is required to meet annual average Total Nitrogen concentration of 5 mg/L or less. The total nitrogen controls required to meet the annual concentration limitation are expected to be more efficient than the controls necessary to meet the TKN demand associated with the ammonia limitation of 3.84 mg/L based on the Richmond Crater Water Quality Management Plan. Therefore, the enhanced nutrient reduction technology will control effluent concentrations of ammonia and BOD.
Also, the $cBOD_5$ concentration limitations are expressed as one significant digit in accordance with GM06-2016 Amendment 1 which states “For BOD, the method is not accurate enough to provide data beyond a whole number.”

(2) TSS load limitations revised to two significant digits to be in conformance with GM06-2016.
(3) Ammonia concentration limitation specified as 3 significant digits in accordance with the rules of precision in GM06-2016 since a design flow of 75.0 MGD design flow were used in calculating monthly and weekly average concentrations.
(4) Removed to eliminate duplicative monitoring, reporting, and limitations included in the VPDES General Permit for Total Nitrogen and Total Phosphorus Discharges to the Chesapeake Bay, in accordance with GM07-2008 and subsequent amendments.
(5) New nutrient removal technology concentration limits included in accordance with GM07-2008 and subsequent amendments. The new limitations will become effective on January 1st following the year after the limitations have been placed in the VPDES permit. Therefore, the limitation will become effective on January 1, 2013.
(6) Fecal Coliform limitation has been replaced with the E. coli limitation in accordance with revisions to the bacteria standards in the Virginia Water Quality Standards (9VAC 25-260-50 effective 1/6/2011). Additionally, VDH has provided correspondence indicating no objection to the E.coli and chlorine monitoring replacing fecal coliform in the permit. See **Attachment 12**.
(7) *E. Coli* limit included in accordance with Virginia Water Quality Standards (9 VAC 25-260-185) and 40 CFR 122.44(d)(1)(iii). Previously, minimum TRC concentrations in the chlorine contact tank served as a surrogate to indicate an adequate bacterial kill; this surrogacy is no longer acceptable. However, it is presumed that no additional equipment or plant modifications are necessary to demonstrate compliance with this limitation; therefore, no compliance schedule was given. Additionally the monitoring is set at 4 per month in accordance with the sampling frequencies in the January 27, 2010 Permit Manual (GM10-2003) for facilities using chlorine disinfection.
(8) Dissolved Sulfide monitoring included in accordance with January 27, 2010 VPDES Permit Manual (GM10-2003).
(9) The total phosphorus concentration limitation of 2.0 mg/L must remain effective due to anti-backsliding until such time that the new, technology based total phosphorus concentration becomes effective on 1/1/13.

2005	2012	Special Condition Changed	Reason for Change
Permit Cover	Permit Cover	Intro Paragraph	Revised to reflect January 27, 2010 Permit Manual (GM10-2003).
Permit Cover	Permit Cover	City	City line item removed since in the Commonwealth of Virginia cities are independent of counties.
Permit Cover	Permit Cover	County	Added “County” to “Henrico”
Permit Cover	Permit Cover	Facility Location	Revised to change location from “Richmond” to “Henrico” in accordance with recent postal changes.
Permit Cover	Permit Cover	Signatory Authority	Revised to reflect Agency Policy 2-09.
Part I.A.1	Part I.A.1	Effluent Limitation and Monitoring Opening Paragraph	Revised to reflect January 27, 2010 Permit Manual (GM10-2003).
Part I.A.1 Definitions	Part I.A.1 Definitions	“NL”	Revised to remove the word “however.”
Part I.A.1 Definitions	Part I.A.1 Definitions	“NA”	No Change
[NEW]	Part I.A.1 Definitions	“24 HC”	Added for clarity of sampling expectation.
Part I.A.1.(1)	Part I.A.1.a[1]	Design Flow	Reference to additional flow requirements in the special conditions added.
Part I.A.1.(2)	Part I.A.1.a[6]	Nutrient Calculation	No Change
Part I.A.1.(3)	Part I.A.1.a[4]	Additional Nutrient Reporting Reference	Reflects GM07-2008, Amendment 2.
Part I.A.1.(4)	Part I.A.1.a[3]	Reference to Additional TRC Limits	Revised to reflect January 27, 2010 Permit Manual (GM10-2003).
Part I.A.1.(5)	[REMOVED]	Schedule of Compliance Reference	Removed because the final compliance was achieved during the 2005 permit term.
[NEW]	Part I.A.1.a[2]	Significant Digits	Added to reflect January 27, 2010 Permit Manual (GM10-2003) and Significant Figures for Discharge Monitoring Reports (GM06-2016).

2005	2012	Special Condition Changed	Reason for Change
[NEW]	Part I.A.1.a[5]	Watershed General Permit Coverage	Added to reflect GM07-2008, Amendment 2.
[NEW]	Part I.A.1.a[7]	"1 per 2 Hours" Definition	Added to reflect January 27, 2010 Permit Manual (GM10-2003).
[NEW]	Part I.A.1.a[8]	"4 per Month"	Added for clarity of sampling expectation.
[NEW]	Part I.A.1.a[9]	"1 per 6 Hours" Definition	Added for clarity of sampling expectation.
[NEW]	Part I.A.1.a[10]	Total Phosphorus Interim Limit End Date	Included to specify that the TP monthly average limitation of 2.0 mg/L is effective until December 31, 2012.
[NEW]	Part I.A.1.a[11]	Total Nitrogen and Total Phosphorus Final Limit Effective Date	Included to specify that the annual average TN and TP limitations of 5.0 and 0.5 mg/L, respectively, become effective on January 1, 2013 in accordance with GM07-2008, Amendment 2.
Part I.A.1.b	Part I.A.1.b	No Visible Solids	No change
Part I.A.1.c	[REMOVED]	Sampling Location	Removed as this condition is not included in DEQ guidance and the compliance point/ sampling location is defined in the O&M Manual.
[NEW]	Part I.A.1.c	85% Removal	Added in accordance with PRO staff decisions June 28, 2011 and January 27, 2010 Permit Manual (GM10-2003).
Part I.A.2	Part I.A.2	Sludge Limitations, Monitoring and Reporting Requirements Opening Paragraph	No Change
Part I.A.2.a	Part I.A.2.a	Annual Sludge Production Reporting	No Change
Part I.A.2.b	Part I.A.2.b	Chemical Pollutant Limitations	No Change
Part I.A.2 Definitions	Part I.A.2 Definitions	"NL"	Revised to clarify that reporting as well as monitoring is required.
Part I.A.2 Definitions	Part I.A.2 Definitions	"NA"	No Change
Part I.A.2 Definitions	Part I.A.2 Definitions	"1 per 2 Months"	Added for clarity of sampling expectation.
Definitions	Part I.A.2.b[1]	*Dry Weight	No Change
[NEW]	Part I.A.2.b[2]	Significant Digits	Added to reflect January 27, 2010 Permit Manual (GM10-2003) and Significant Figures for Discharge Monitoring Reports (GM06-2016).
Part I.A.2.c	Part I.A.2.c	Pathogen Reduction Limitations	No Change
Part I.A.2.d	Part I.A.2.d	Vector Attraction Reduction Limitations	No Change
Part I.A.2.e	Part I.A.2.e	Additional Sludge Monitoring and Reporting Requirements	Revised for clarity.
Part I.B.1	Part I.B.1	Additional TRC Limitations and Monitoring Requirements	Updated to reflect January 27, 2010 Permit Manual so that the monitoring frequency as listed in Part I.B.2 has been updated from 3/week to 1 per day in the event that the facility does not use chlorination for disinfection.
Part I.C.1	Part I.C.1	95% Capacity Reopener	Revised to specify "DEQ" Piedmont Regional Office.
Part I.C.2	Part I.C.2	Indirect Dischargers	No change.
Part I.C.3	Part I.C.3	Operations & Maintenance Manual	Revised to reflect change in boilerplate and agency policy per email dated April 3, 2012 from E. Daub.
Part I.C.4	Part I.C.4	Licensed Operator Requirement	No change.
Part I.C.5	Part I.C.5	Reliability Class	No change.

2005	2012	Special Condition Changed	Reason for Change
Part I.C.6	Part I.C.6	Sludge Use and Disposal	Revised to reflect January 27, 2010 Permit Manual (GM10-2003).
Part I.C.7	Part I.C.7	Sludge Reopener	No change.
Part I.C.8	Part I.C.8	Compliance Reporting	Revised to reflect January 27, 2010 Permit Manual.
Part I.C.9	Part I.C.9	Materials Storage and Handling	Revised to reflect January 27, 2010 Permit Manual (GM10-2003).
Part I.C.10	Part I.C.10	CTC, CTO Requirement	Reflects January 27, 2010 Permit Manual (GM10-2003) and GM07-2008, Amendment 2.
Part I.C.11 Part I.C.12	Part I.C.11	Reopeners	Combined and revised to reflect GM07-2008, Amendment 2.
[NEW]	Part I.C.12	Facility Closure	Reflects PRO Staff Decisions (December 2, 2008).
Part I.C.13	Part I.C.13	Nutrient Reporting Calculations	The Nutrient Reporting calculation varies from guidance in that it clarifies where the monthly average concentrations are reported (i.e. the nutrient general permit DMR).
[NEW]	Part I.C.14	Suspension of Annual Average Concentration Limitations for E3/E4 Facilities	
Part I.C.14	[REMOVED]	Basis of Design	Removed in accordance with GM07-2008, Amendment 2.
Part I.C.15	[REMOVED]	Interim Optimization Plan	
Part I.C.16	[REMOVED]	General Permit Controls	
Part I.D	Part I.D	Pretreatment Requirements	Revised per January 27, 2010 Permit Manual (GM10-2003) and PRO boilerplate. Specifically, Parts I.D: 2.a(1), 2.a(9), 2.e, 2.j, 5.a, 5.c, 7, 8, 10, 11, 12, 13, and 14 were revised to clarify reporting time frames, requirements, and deadlines and to address non-discharging pretreatment facilities. Additionally, acronyms were spelled out with their first use. With the exception of the annual report (which requires an original signature), electronic submittals of pretreatment requirements are preferred. As requested by the permittee in a letter dated April 10, 2012 regarding comments on the draft permit, the industrial user survey due date as required by Part I.D.11 was changed from 180 days after the permit effective date to one year after the permit effective date in order to address concern by the Henrico County in coordinating the survey with newly implemented software. See Attachment 15 for additional information. D. Debiasi with DEQ CO approved the change in boilerplate language.
Part I.E	Part I.E	Whole Effluent Toxicity	Revised based on BPJ and consultation with D. Debiasi (CO) after analysis of previous WET monitoring results.
Part I.F	Part I.F	Sludge Records	Updated to reflect changes in the special condition numbering
Part I.G	Part I.G	Sludge Reporting	
Part I.H	[REMOVED]	Schedule of Compliance	Limitations became effective during the term of the 2005 permit and schedule has ended.
[NEW]	Part II.A.4	Monitoring	Incorporated to reflect change in laboratory accreditation requirements.

22. Variances/Alternate Limits or Conditions: None

23. Regulation of Users: 9VAC25-31-280 B.9: Not Applicable because this treatment works is owned by the Commonwealth of Virginia.

24. Public Notice Information required by 9 VAC 25-31-280 B:

All pertinent information is on file and may be inspected or copied by contacting

Ms. Jaime Bauer
Virginia DEQ - Piedmont Regional Office
4949-A Cox Road
Glen Allen, Virginia 23060-6296
Telephone Number: 804-527-5015
Facsimile Number: 804-527-5106
Email: jaime.bauer@deq.virginia.gov

DEQ accepts comments and requests for public hearing by e-mail, fax or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. A public hearing may be held, including another comment period, if public response is significant, based on individual requests for a public hearing, and there are substantial, disputed issues relevant to the permit. The public may review the draft permit and application at the DEQ Piedmont Regional Office by appointment or may request copies of the documents from the contact person listed above.

Public Notice Requirements: The legal ad announcing the public comment period was run in the Richmond Times-Dispatch on May 3, 2012 and May 10, 2012. The comment period began on May 3, 2012 and ended at 11:59 pm on June 4, 2012.

25. Additional Comments:

a. **Previous Board Action: None**

b. **Staff Comments:**

- Financial assurance does not apply to this facility because it is a POTW.

- The 2012 fiscal year permit maintenance fee for the facility was deposited on September 14, 2011.

- This project is not considered to be controversial**.**

- The facility is an eDMR participant and has been enrolled in the program since June 3, 2009.

- This facility is not eligible for reduced monitoring because the facility is operating under a consent decree due to multiple sewer sanitary overflows that have occurred over the past few years.

- Discharges associated with exposure to industrial stormwater at this site are addressed via VAR051633.

- A registration statement for the nutrient general permit has been received and the associated general permit issued as VAN040081.

- This facility is not a participant in the Virginia Environmental Excellence Program **(**VEEP).

- The discharge for this facility is located 8.1 miles upstream from the City of Hopewell's water intake. In a letter dated February 7, 1994 Virginia Department of Health (VDH) expressed concerns regarding the bacterial monitoring frequencies established in the VPDES permit for the Henrico County WRF. In order to address VDH's concerns, bacterial monitoring was historically set at once per day. Currently, the freshwater bacteria standard in the Virginia Water Quality Standards is now expressed in terms of *E. coli*. Agency staff contacted VDH to explore streamlining bacteria limitations and monitoring in the permit while also ensuring protection of water quality and human health. VDH provided comments in an email dated February 6, 2012, that they do not object to the replacement of the fecal coliform limitation with the *E. coli* and chlorine limitations set forth in the permit. See **Attachment 12** for the 1994 and 2012 VDH correspondence.

- In accordance §62.1-44.15:01.A.2, 9 VAC25-31-290.G.2 and GM11-005, the Regional Planning District Commission (RRPDC), the County Administrator, and the Chairman of the Board of Supervisors were notified of the public comment period and sent the legal notice for the draft permit in a letter dated May 1, 2012. A memorandum was received from the RRPDC on May 17, 2012 stating that they support the proposed permit.

c. **EPA Comments:** The draft permit was forward for EPA review on March 6, 2012 because the facility is classified as major and discharges to a receiving stream listed on the 303(d) list. EPA sent an email on March 27, 2012 stating that they had no comment related to the compliance with TMDL requirements. No further comments were received.

d. **VDH Comments:** The permit application was forward to the Virginia Department of Health for review and comment on June 9, 2011. No comments were received.

e. **Owner Comments:** On April 10, 2012, Henrico County submitted a letter containing various comments and questions concerning the draft permit. The agency responded in a later dated April 20, 2012. See **Attachment 15** for Owner Comments and Agency Response.

f. **Public Comments:** A request was received on May 14, 2012 from Tarah Heinzen, an attorney with the Environmental Integrity Project (EIP), for copies of the draft permit, fact sheet, and reissuance application. Staff provided the requested documents by e-mail on May 15, 2012. On June 4, 2012, Jameson Brunkow the Lower James Riverkeeper with the James River Association (JRA) requested copies to the draft permit and fact sheet. Staff provided electronic copies of the documents the same day. Both EIP and JRA submitted comments on the draft VPDES permit dated June 4, 2012 prior to close of the public comment period. See **Attachment 16** for public comments received as well as the DEQ staff response to these comments.

g. **Other Agency Comments**: No comments were received.

h. **Planning Conformance Statement**: This discharge is in conformance with the existing planning documents for the area.

26. 303(d) Listed Segments (TMDL): During the 2010 305(b)/303(d) Water Quality Assessment, the receiving stream was considered a Category 5A water ("A Water Quality Standard is not attained. The water is impaired or threatened for one or more designated uses by a pollutant(s) and requires a TMDL (303d list).") The Recreation Use is impaired due to E. coli. The Aquatic Life Use is impaired due to inadequate submerged aquatic vegetation (SAV), low dissolved oxygen, and elevated chlorophyll a; in addition, mercury is considered a non-impairing observed effect due

to a sediment screening value exceedance. The Fish Consumption Use is impaired due to a VDH Fish Consumption Advisory for PCBs; observed effects include kepone due to a VDH advisory and mercury due to a fish tissue screening value exceedance in largemouth bass. The Wildlife Use is fully supporting.

The facility has been addressed in the bacterial TMDL for the James River and Tributaries – City of Richmond which was approved by the EPA on November 4, 2010; the facility received an annual E. coli wasteload allocation of 1.31E+14 cfu/year based on a design flow of 75.0 MGD. Compliance with the E. coli permit limitation of 126 n/100 mL (@75.0 MGD =1.31E+14 cfu/yr) will demonstrate compliance with the bacterial TMDL.

In the James River Basin section of the Virginia Water Quality Management Planning Regulation (9 VAC 25-720-60 B), the facility received the following seasonal wasteload allocations for $cBOD_5$ and ammonia as listed in Table B7 - Richmond Crater Interim Water Quality Management Plan (1988):

	$cBOD_5$ (lb/day)	Ammonia (lb/day)
Summer (June – October)	3002	2403
Winter (November – May)	4756	3504

These wasteload allocations are included in Part I.A.1 of the permit along with associated concentrations based on the design flow of the facility of 75.0 MGD. Additionally, the plan establishes a minimum dissolved oxygen concentration of 5.6 mg/L. Compliance with TSS, $cBOD_5$, and DO limitations in the permit will demonstrate compliance with the Richmond Crater Water Quality Management Plan.

This facility discharges directly to the James River in the Chesapeake Bay watershed in segment JMSTF2. The receiving stream has been addressed in the Chesapeake Bay TMDL, approved by EPA on December 29, 2010. The TMDL addresses dissolved oxygen (DO), chlorophyll a, and submerged aquatic vegetation (SAV) impairments in the main stem Chesapeake Bay and its tidal tributaries by establishing non-point source load allocations (LAs) and point-source waste load allocations (WLAs) for Total Nitrogen (TN), Total Phosphorus (TP) and Total Suspended Solids (TSS) to meet applicable Virginia Water Quality Standards contained in 9VAC25-260-185. This facility is considered a Significant Chesapeake Bay wastewater discharge. All Significant Chesapeake Bay wastewater discharges in segment JMSTF2 have been assigned aggregate WLAs of 4,454,769.63 pounds per year TN, 370,167.48 pounds per year TP, and 45,474,581.82 pounds per year TSS.

Implementation of the Chesapeake Bay TDML is currently accomplished in accordance with the Commonwealth of Virginia's Phase I Watershed Implementation Plan (WIP), approved by EPA on December 29, 2010. The approved WIP recognizes that the TMDL nutrient WLAs for Significant Chesapeake Bay wastewater dischargers are set in two regulations: 1) the Water Quality Management Planning Regulation (9VAC25-720); and 2) the "General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed of Virginia" (9VAC25-820). The WIP further outlines that since TSS discharges from wastewater facilities represent an insignificant portion of the Bay's total sediment load, they may be considered in the aggregate. The WIP also states that wastewater discharges with technology-based TSS limits are considered consistent with the TMDL.

40 CFR 122.44(d)(1)(vii)(B) requires permits to be written with effluent limits necessary to meet water quality standards and to be consistent with the assumptions and requirements of applicable WLAs. DEQ has provided coverage under the VPDES Nutrient General Permit (GP) for this facility under permit VAN040081. The requirements of the Nutrient GP currently in effect for this facility are consistent with the Chesapeake Bay TMDL. This individual permit includes technology-based TSS limits of 8.0 mg/L that are also consistent with the Chesapeake Bay TMDL and WIP. In addition, the individual permit has limits of $cBOD_5$ 5 and 8 mg/L and DO value of 5.6 mg/L which provide protection of instream DO concentrations to at least 5.0 mg/L. However,

implementation of the full Chesapeake Bay WIP, including GP reductions combined with actions proposed in other source sectors, is expected to adequately address ambient conditions such that the proposed effluent limits of this individual permit are consistent with the Chesapeake Bay TMDL, and will not cause an impairment or observed violation of the standards for DO, chlorophyll a, or SAV as required by 9VAC25-260-185.

See **Attachment 8** for the Richmond Crater Water Quality Management Plan and **Attachment 13** for the TMDL Fact Sheets.

27. Summary of attachments to this Fact Sheet:

Attachment 1	Flow Frequency Analysis
Attachment 2	Facility Diagram
Attachment 3	Topographic Map
Attachment 4	Onsite Material Storage Information
Attachment 5	Ambient Water Quality Data for 2-JMS094.96 and 2-JMS099.30
Attachment 6	Site Visit Memorandum
Attachment 7	Effluent Data
Attachment 8	1989 Richmond Crater Water Quality Management Plan
Attachment 9	Cormix Model
Attachment 10	Effluent Limitation Development
Attachment 11	WET Testing Evaluation and Limitation Development
Attachment 12	VDH Letter Regarding Bacterial Monitoring Frequencies
Attachment 13	2010 TMDL Fact Sheet
Attachment 14	Nutrient Upgrade CTO (July 25, 2011)
Attachment 15	Owner Comments and Agency Response
Attachment 16	Public Comments Received and Agency Response

Attachment 1 – Flow Frequency Analysis

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office
4949-A Cox Road Glen Allen, Virginia 23060

SUBJECT: Flow Frequency Determination / 303(d) Status
Henrico County WRF – VA0063690

TO: Jaime Bauer

FROM: Jennifer Palmore, P.G.

DATE: April 28, 2011

COPIES: File

The Henrico County Water Reclamation Facility discharges to the James River near Dutch Gap, VA. The outfall is located at rivermile 2-JMS094.58. Flow frequencies have been requested at this site for use in developing effluent limitations for the VPDES permit.

At the discharge point the river is tidally influenced and flow frequencies cannot be determined. The previously calculated dilution rations should be used to calculate permit limitations. The discharge is located within the tidal freshwater zone of the James River; therefore the freshwater criteria should be applied.

During the 2010 305(b)/303(d) Water Quality Assessment, the receiving stream was considered a Category 5A water ("A Water Quality Standard is not attained. The water is impaired or threatened for one or more designated uses by a pollutant(s) and requires a TMDL (303d list).") The applicable fact sheets are attached. The Recreation Use is impaired due to E. coli. The Aquatic Life Use is impaired due to inadequate submerged aquatic vegetation (SAV), low dissolved oxygen, and elevated chlorophyll a; in addition, mercury is considered a non-impairing observed effect due to a sediment screening value exceedance. The Fish Consumption Use is impaired due to a VDH Fish Consumption Advisory for PCBs; observed effects include kepone due to a VDH advisory and mercury due to a fish tissue screening value exceedance in largemouth bass. The Wildlife Use is fully supporting.

The receiving stream has been addressed in two TMDLs. The bacterial TMDL for the James River and Tributaries – City of Richmond was approved by the EPA on 11/4/2010; the facility was included in the TMDL and received an annual E. coli wasteload allocation of 1.31E+14 cfu/year based on a design flow of 75.0 MGD. The Chesapeake Bay TMDL was approved by the EPA on 12/29/2010; Henrico WRF was included in the aggregated total nitrogen-, total phosphorus-, and total suspended solids wasteload allocations for significant wastewater dischargers in segment JMSTF2.

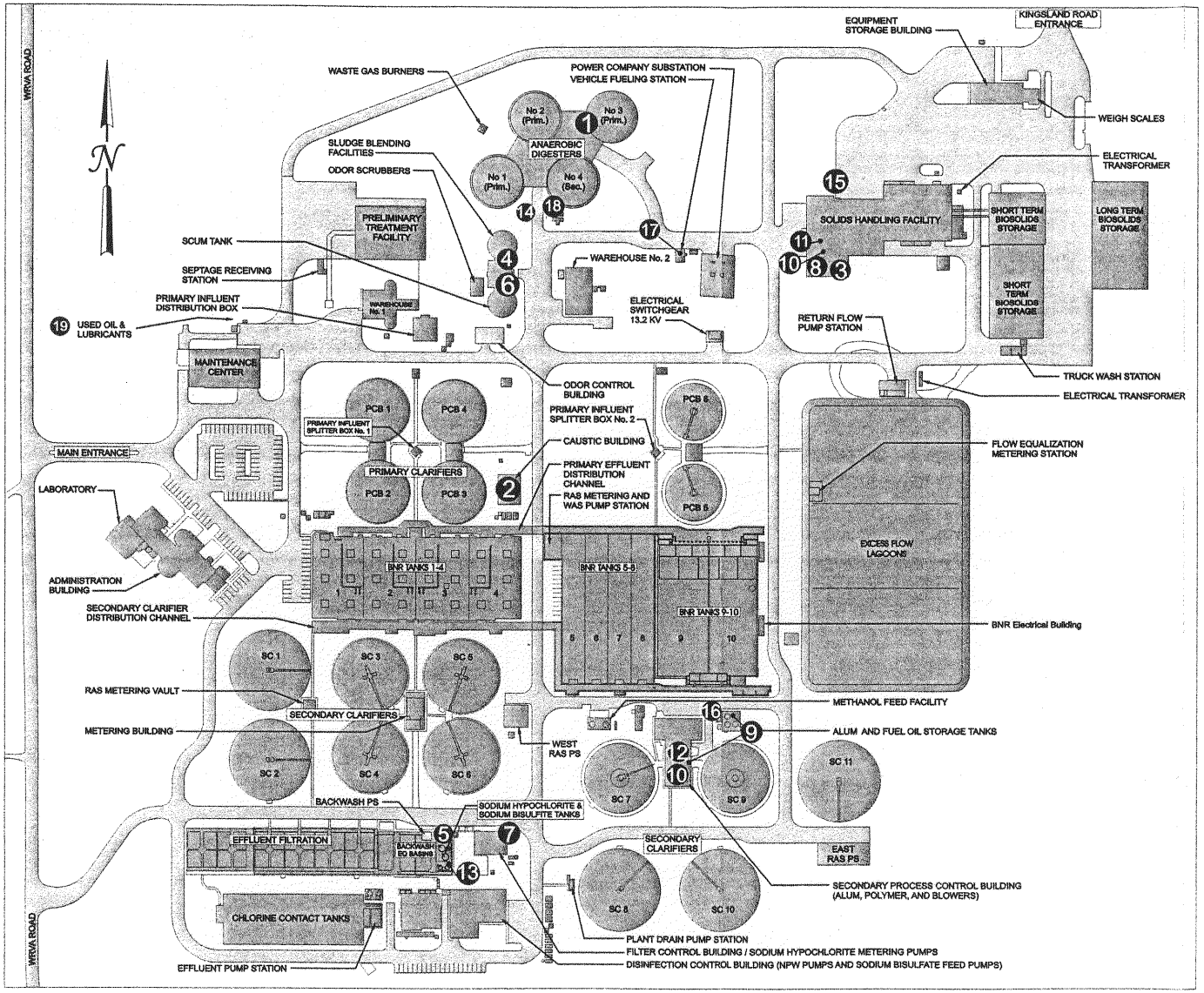
The Richmond-Crater Water Quality Management Plan allocates BOD and ammonia in order to maintain a minimum dissolved oxygen of 5.0 mg/L in the James River. As 5.0 mg/L was the dissolved oxygen standard at the time the plan was developed, the river has been considered a Tier 1 water.

Water quality monitoring data is attached. Field data from station 2-JMS094.96 was chosen to characterize the river at the discharge point. The station is located on the James River at Buoy 150, which is approximately 0.4 mile upstream of the outfall. Unfortunately, hardness data was not available from this station, so station 2-JMS099.30 was used. The station is located on the James River at Buoy 157, approximately 4.7 miles upstream of the discharge.

If you have any questions concerning this analysis, or need any additional information, please let me know.

Attachment 2 – Facility Diagram

Henrico County WRF
VA 00 63690
"Site Plan" Attachment 1



LEGEND

Chemical Storage

1. Digester Gas - Flammable Gas
2. Sodium Hydroxide - Corrosive
3. Sodium Hydroxide - Corrosive
4. Sodium Hydroxide - Corrosive
5. Sodium Hypochlorite - Corrosive
6. Sodium Hypochlorite - Corrosive
7. Sodium Hypochlorite - Corrosive
8. Sodium Hypochlorite - Corrosive
9. Aluminum Sulfate - Irritant
10. Polymer (emulsion) - Slip hazard
11. Polymer (dry) -dust,eye,lung irritant, slip haz.
12. Polymer (dry) - dust,eye,lung irritant, slip haz.
13. Sodium Bisulfite - Irritant
14. Fuel Oil #2 - Combustible liquid
15. Fuel Oil #2 - Combustible liquid
16. Fuel Oil #2 - Combustible liquid
17. Unleaded gas & diesel fuel - Flammable & Combustible
18. Propane gas, LPG - Flammable
19. Used Oil & Lubricants

Henrico Water Reclamation Facility Site Plan

\\WDPU289\shares\Maintenance\CADdrawings\SiteMaps\ChemTestWRFMap2

A chronology of the HCWRF is as follows:

Year	Description
1985	Construction begins on new 30 MGD Henrico Regional Wastewater Treatment Facility which consists of a head works facility, 4 primary settling basins, 4 pure oxygen aeration basins, a cryogenic plant, 4 secondary clarifiers, 4 effluent filters, and 2 ozone disinfection contact basins. Flow equalization facilities consisted of 2 dedicated primary clarifiers, and 3 excess flow holding lagoons. Solids facilities consist of 2 dissolved air floatation sludge thickening tanks, and 3 anaerobic digesters. Support facilities include odor control facility, maintenance center and administration building.
1986	Construction begins on over 3 miles of new 72" outfall from the WRF to the James River.
1987	Construction begins on a new dewatering and composting facility.
1989	November 8, 1989 at 12:55pm, the facility went online.
1993	Construction begins on a plant expansion to 45 MGD which included the addition of 2 three stage BNR tanks, a new secondary process control building housing 3 multistage centrifugal blowers to replace the original pure oxygen cryogenic plant, 2 secondary clarifiers, methanol feed facilities, alum feed facilities, polymer feed facilities and expanded ozone facilities. This project also included piping which allowed primary settling basins 5 and 6 to discharge into the new BNR basins.
1994	Construction begins on 4 new CenTROL filters to replace the 4 filters originally constructed in 1985, which are then converted into backwash equalization basins. This project also included sodium hypochlorite storage and feed facilities and chemical piping to the filter influent channel. This system would eventually replace the ozone system and served as the primary means of disinfection until completion of the chlorine contact tanks which began construction in 2001.
1998	Phase 1 of the 75 MGD expansion begins construction adding a new Preliminary Treatment Facilities and a primary settling basin distribution box to replace the original 1985 head works building, which is then converted into a warehouse.
1999	Phase 2 of the 75 MGD expansion begins construction adding 4 six stage BNR basins, primary effluent and secondary clarifier influent distribution channels, 5 secondary clarifiers, and sodium hypochlorite and sodium bisulfite storage and feed facilities. Two new aeration blowers are also added into the 1993 blower building.
2001	Phase 3 of the 75 MGD expansion begins construction on various solids facilities including 1 new anaerobic digester, modifications to 3 existing digesters, 2 boilers for digester heat, 2 gravity belt thickeners, 3 centrifuges and additional covered biosolids storage. In addition, odor control facilities were added for the preliminary treatment facilities and primary settling basins, a 500 KW emergency generator and one of the original DAF thickening tanks is converted into a sludge blending tank for TWAS, PS, and primary scum.
2001	Phase 4 of the 75 MGD expansion begins construction on 2 additional effluent filters, backwash return pumps, an upgrade of the plant NPW system, 6 chlorine contact tanks, 3 effluent pumps for high flows and retrofitting BNR 1 – 4 with fine bubble membrane diffusers. The original ozone building was converted into a storage building.

2002 Phase 5 of the 75 MGD expansion begins construction on 16,300-LF of 42" force main from the effluent pump station to the existing 72" outfall to the James River.

2002 Phase 6 of the 75 MGD expansion begins construction on a 3,100 SF lab expansion at the existing WRF administration building.

2006 WRF must meet an annual average TN of ≤ 8.0 mg/L as of January 2006 due to a grant received for the 75 MGD expansion.

2007 Construction begins on miscellaneous improvements including replacing the backwash baffles on effluent filters 1 – 4, replacing 2 of the original caustic storage tanks, and a new biosolids distribution conveyor.

2007 Phase 7 begins construction of 2 six stage ENR tanks, and modifications of existing BNRs 9 and 10 to provide a five stage ENR technology. This work is required to replace BNRs 1 – 4, which cannot meet the new TN standard of 5.0 mg/L at 75 MGD (annual average basis).

2010 Construction begins on Primary Settling Basin 1 – 6 repair of concrete in the effluent launders corroded by hydrogen sulfide. Phase 7: 2 new six-stage ENR tanks completed and placed in service.

2011 WRF must meet an annual average TN of ≤ 5.0 mg/L as of January 2011. VPDES General Nutrient Permit Waste Load Allocations for TN and TP are 1,142,085 lb/yr and 114,209 lb/yr, respectively.

2011 Phase 7 construction activities completed; 2 three-stage BNRs converted to five-stage ENR completed and placed in service.

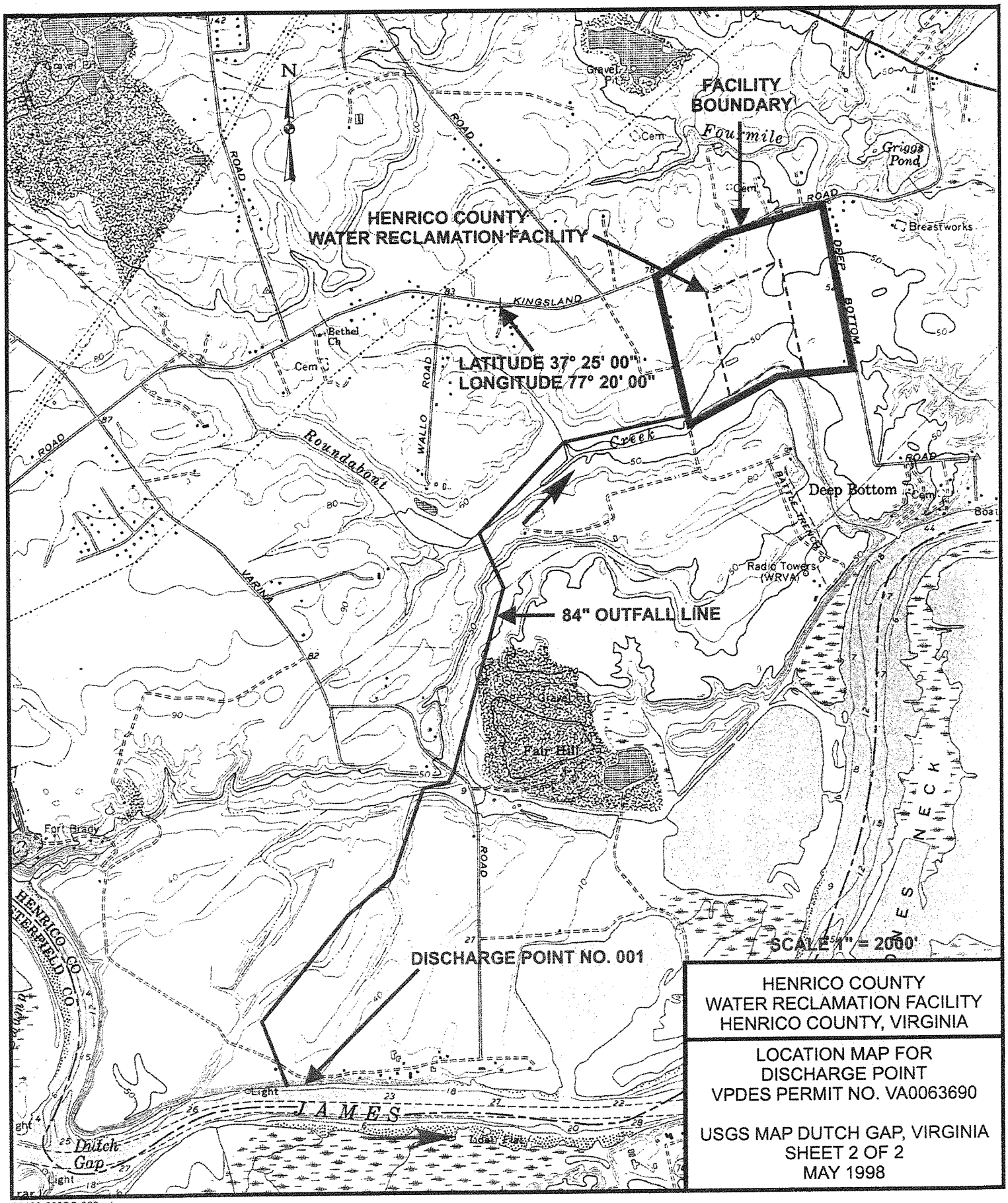
Attachment 3 – Topographic Map


Roundabout
Creek
Deep Bottom
Fair Hill
Fort Brady
HENRICO CO
CHESTERFIELD CO.
JAMES
RIVER
JONES NECK
Dutch Gap
Jones Neck Cutoff
Meadowville
Farrar Island
Old Channel
JAMES RIVER
Outfall 001

Attachment No. 5

Henrico County VA

VA0063690



HENRICO COUNTY
WATER RECLAMATION FACILITY
HENRICO COUNTY, VIRGINIA

LOCATION MAP FOR
DISCHARGE POINT
VPDES PERMIT NO. VA0063690

USGS MAP DUTCH GAP, VIRGINIA
SHEET 2 OF 2
MAY 1998

30100-002SC-002.cdr

Attachment 4 – Onsite Material Storage Information

HENRICO COUNTY WRF
DEPT. OF PUBLIC UTILITIES
Revised: April 1, 2011

LIST OF CHEMICALS, MATERIALS & OTHER SUBSTANCES FOUND AND/OR UTILIZED ON SITE

No. on Site Map	Chemical/Substance	Location	Quantity Stored/Produced	Hazard	Comments
1	Digester gas (55-65% CH_4, 30 – 35% CO_2 and >5% other gases)	Digester Complex	Gas stored/present under the three (3) anaerobic digester covers, red colored piping in the Digester Complex and boilers #1, #2, #4 & #5 use it as a fuel	Flammable gas	Essentially nontoxic; Simple asphyxiant, high concentrations may exclude an adequate supply of oxygen in closed areas; Potentially explosive, flammable over a wide range when combined with oxygen
2	Sodium hydroxide (50% NaOH)	Caustic Bldg., interior	2 - 9,000 gal. & 1 - 7,500 gal. steel tanks used for storing, diluting & feeding 3 tank batch system	Corrosive	Destructive to skin, eye & other body tissues; causes severe burns. Avoid direct contact with water, causes violent exothermic reaction
3	Sodium hydroxide (50% NaOH)	Solids Handling, interior	2,300 gal. stainless steel tank for odor control scrubber system	Corrosive	Destructive to skin, eye & other body tissues; causes severe burns. Avoid direct contact with water, causes violent exothermic reaction
4	Sodium hydroxide (50% NaOH)	Sludge Blend Facilities, interior	1,000 gal. steel tank, NaOH transferred from Caustic Bldg.	Corrosive	Destructive to skin, eye & other body tissues; causes severe burns. Avoid direct contact with water, causes violent exothermic reaction
5	Sodium hypochlorite (12-15% NaOCl)	Disinfection Facilities, Chemical Storage Facility, exterior, above ground, under canopy roof	32,000 gallons of storage volume; two (2) FRP tanks, 16,000 gals. each, effluent disinfection	Corrosive	Severe irritant to skin, lungs & eyes, vapors contain various chlorine compounds
6	Sodium hypochlorite (12-15% NaOCl)	Sludge Blend Facilities, interior	1,000 gals. Polyethylene day tank, NaOCl transferred from Solid Handling Facility	Corrosive	Severe irritant to skin, lungs & eyes, vapors contain various chlorine compounds
7	Sodium hypochlorite (12-15% NaOCl)	Filter Control Bldg., interior	9,000 gals. FRP tank	Corrosive	Severe irritant to skin, lungs & eyes, vapors contain various chlorine compounds
8	Sodium hypochlorite (12-15% NaOCl)	Solids Handling, interior	9,000 gals. FRP tank for odor control scrubber system & transfer to Sludge Blend Facilities	Corrosive	Severe irritant to skin, lungs & eyes, vapors contain various chlorine compounds

No. on Site Map	Chemical/Substance	Location	Quantity Stored/Produced	Hazard	Comments
9	Aluminum sulfate (48% $Al_2(SO_4)_3$)	Secondary Process Control Bldg., exterior	74,100 gals. (3-24,700 gal. tanks, above ground) Tanks maintained empty as of 1/1/11.	Irritant	Irritate or burn digestive tract, eyes and skin, alum mists may irritate respiratory tract
10	Polymer (emulsion)	Solids Handling Facilities – GBT & DC, interior	6.300 gals. FRP tank	Slip hazard	Product and wetting of product creates slippery conditions
11	Polymer (dry granular form)	Solids Handling Facilities – GBT & DC, interior	5-30 super bags; 1,500 lbs. each	Dust, eye & inhalation irritant, slip hazard	Avoid eye contact & inhalation of dusts; wetted products create slip hazards.
12	Polymer (dry granular form)	Secondary Process Control Bldg., interior	1-4 4,000 lb. pallets of 50 lb. bags (amount varies)	Dust, eye & inhalation irritant, slip hazard	Dust in sufficient concentration can result in an explosive mixture in air; wetted products create slip hazards.
13	Sodium Bisulfite (38-40% $NaHSO_3$)	Disinfection Facilities, Chemical Storage Facilities, exterior	16,000 gals; 2 FRP tanks, 8,000 gals. Each	Irritant	Releases SO_2 gas with heat conditions, avoid contact with eyes & skin & avoid breathing mist & vapors, sulfur smell
14	Fuel Oil, No. 2 (for boilers)	Digester Complex, exterior	15,000 gals. (under grnd. tank)	Combustible liquid	No open flame or heat source within 35 ft. of tank.
15	Fuel Oil, No. 2 (for boilers)	North of Solids Handling Facilities, exterior	20,000 gals. (above grnd. tank)	Combustible liquid	No open flame or heat source within 35 ft. of tank
16	Fuel Oil, No. 2 (for boiler)	Sec. Process Control Bldg., exterior	5,000 gals. (above grnd. tank)	Combustible liquid	No open flame or heat source within 35 ft. of gas pumps & tank
17	Unleaded gas & Diesel fuel	Gas pumps @ Fueling Station	4,000 gals. - gas 2,000 gals. - diesel (Both tanks under grnd.)	Flammable liquid (gas) Combustible liquid (diesel)	No open flame or heat source within 35 ft. of gas pumps & tank
18	Propane Gas, LPG (for boiler)	Digester Complex, south exterior	250 gals. (above grnd. tank)	Flammable gas	No open flame or heat source within 35 ft. of tank
19	Used Oil and Lubricants	North side of Maintenance Center	500 gals – used oil and lubricants	Combustible liquid	No open flames or heat source within 35 ft. of tank
20	Magnesium Hydroxide	Secondary Clarifier Distribution Channel next to BNR Tank No. 4	4000 gallon above ground tank – NOTE: Scheduled to move this product inside CAU bldg by July 1, 2011	Eye and respiratory irritant	Do not store in aluminum tanks, do not allow product to freeze. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing. The use of eye protection, gloves, and long sleeve clothing is recommended.

Attachment 5 – Ambient Water Quality Data for 2-JMS094.96 and 2-JMS099.30

	Ambient Water Quality Data for 2-JMS094.96							
Collection Date	**Depth Desc**	**Depth**	**Temp Celcius**	**Field Ph**	**Do Probe**	**Do Winkler**	**Salinity**	**Secchi Depth**
7/22/1968	S	1	31.11	7.5		10		
9/8/1968	S	1	26.67	8		7.8		
3/20/1969	S	1	11.11	7.2		9.2		
6/19/1969	S	1	28.89	6.2		4.9		
10/2/1969	S	1	22.78	7.2		5		
4/21/1970	S	1	17.22	7.3		7.6		
5/5/1970	S	1	20	6.9		7.2		
6/18/1970	S	1	29.44	6.8		3.4		
7/2/1970	S	1	28.89	7.3		6.6		
7/22/1970	S	1	29.44	7.1		3.8		
8/15/1970	S	1	32.22	7		6		
8/26/1970	S	1	32.22	7.3		8.2		
9/9/1970	S	1	31.11	7.2		9		
5/6/1971	S	1	16.67	7.2		7		
6/13/1971	S	1	24.44	7.3		6		
7/5/1971	S	1	27.78	8		8		
7/23/1971	S	1	28.33	7.5		7		
8/3/1971	S	1	30.56	7.4		5		
8/31/1971	S	1	31.11	7.4		6.2		
9/26/1971	S	1	25	7.5		6.4		
10/27/1971	S	1	18.89	7		8.6		
5/2/1972	S	1	21.11	7		6.8		
6/17/1972	S	1	27.78	7.2		4.4		
7/8/1972	S	1	21.11	7.3		7.4		
7/31/1972	S	1	27.78	7.5		6.2		
8/9/1972	S	1		7.2		6.8		
8/20/1972	S	1		7.6		6.6		
9/5/1972	S	1	26.67	7		5.6		
10/4/1972	S	1	22.22	7.5		6.2		
5/3/1973	S	1	17.78	6.8		8.3		
6/6/1973	S	1	26.67	7.5		7.2		
6/9/1973	S	1	30	7.6		12		
7/15/1973	S	1	32.22	7.4		6.2		
9/29/1973	S	1	33.33	7.5		5.6		
5/26/1974	S	1	23.33	7.3		6.5		
6/7/1974	S	1	22.78	7.5		8.8		
6/27/1974	S	1	26.11	7.3		7.4		
7/2/1974	S	1	26.67	7.5		7.2		
7/26/1974	S	1	31.67	7.5		6.2		
8/5/1974	S	1	28.33	6.9		5.6		
8/30/1974	S	1	31	7.5		6.8		
6/28/1983	S	1	29.5	7.1		8.6		0.6
7/14/1994	S	0.3	33.28	7.21	5.78			
7/28/1994	S	0.3	31.12	7.33	5.95			
8/18/1994	S	0.3	30.49	7.38	6.42			
8/30/1994	S	0.3	29	7.46	7.51			
9/13/1994	S	0.3	27.5	7.95	9.12			
9/26/1994	S	0.3	24.39	7.29	6.99			
10/12/1994	S	0.3	20.17	7.46	9.18			
10/25/1994	S	0.3	19.75	7.65	9.76			
5/3/1995	S	0.3	18.24	7.33	8.55			
5/18/1995	S	0.3	22.64	7.15	7.7			
6/1/1995	S	0.3	28.52	7.63	8.1			
7/31/1995	S	0.3	34.84	7.81	6.15		0	
8/28/1995	S	0.3	33.19	7.1	5.79			
9/11/1995	S	0.3	29.55	7.02	7.35			
10/5/1995	S	0.3	24.64	7.2	7.47			
10/24/1995	S	0.3	17	7.13	8.91			
5/6/1996	S	0.3	23.57	8.42	8.05			
5/28/1996	S	0.3	21.34	7.35	8.05			
6/3/1996	S	0.3	22.9	7.83	8.78			
6/12/1996	S	0.3	25.68	7.2	7.6			
7/1/1996	S	0.3	31.8	7.46	6.54			
7/15/1996	S	0.3	30.04	7.36	6.99			
8/1/1996	S	0.3	31.57	7.37	6.31			

Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Salinity	Secchi Depth
8/15/1996	S	0.3	27.74	7.24	6.87			
9/16/1996	S	0.3	25.37	7.5	6.76			
9/30/1996	S	0.3	22.39	7.7	7.77			
10/9/1996	S	0.3	20.26	7.48	8.08			
10/30/1996	S	0.3	20.6	7.48	8.43			
5/21/1997	S	0.3	25.58	7.55	7.6			
5/27/1997	S	0.3	22.92	7.36	6.81			
6/3/1997	S	0.3	24.86	7.2	6.84			
6/23/1997	S	0.3	32.6	8.05	7.5			
7/9/1997	S	0.3	34.85	7.98	6.96			
7/23/1997	S	0.3	32.03	7.23				
8/7/1997	S	0.3	31.45	7.54	6.86			
8/21/1997	S	0.3	33.2	7.3	5.76			
9/4/1997	S	0.3	30.41	7.89	6.85			
10/2/1997	S	0.3	24.35	7.98	8.64			
10/20/1997	S	0.3	23	7.5	6.63			
5/18/1998	S	0.3	23.02	7.97	8.75			
5/27/1998	S	0.3	26.82	7.9	7.6			
6/17/1998	S	0.3	27.8	7.92	7.57			
6/30/1998	S	0.3	33.26	7.71	7			
7/14/1998	S	0.3	33.27	8.01	9			
7/28/1998	S	0.3	35.72	7.82	7.09			
8/11/1998	S	0.3	34.9	7.73	6.96			
8/25/1998	S	0.3	36.1	8.24	7.1			
9/14/1998	S	0.3	28.48	8.27	9.26			
9/29/1998	S	0.3	29.25	8.2	8.41			
10/13/1998	S	0.3	22.72	7.74	8			
10/26/1998	S	0.3	22.08	7.89	8.75			
5/25/1999	S	0.3	24.03	7.3	7.02			
6/7/1999	S	0.3	31.89	8.73	9.57			
6/21/1999	S	0.3	27.87	7.21	6.55			
7/7/1999	S	0.3	34.6	7.62	6.85			
7/21/1999	S	0.3	33.85	7.96	7.68			
8/10/1999	S	0.3	34.06	7.93	6.88			
8/31/1999	S	0.3	29.1	7.57	6.95		0	
9/13/1999	S	0.3	26.44	7.67	8.16			
9/29/1999	S	0.3	25	7.23	7.6		0	
10/13/1999	S	0.3	22.07	7.32	8.08		0	
10/26/1999	S	0.3	17.44	7.51	9.68		0	
5/1/2000	S	0.3	16.92	7.16	9.83		0	
5/22/2000	S	0.3	28.61	7.3	5.85		0	
6/5/2000	S	0.3	27.66	7.67	7.9		0	
6/22/2000	S	0.3	31.9	7.52	6.79		0	
7/11/2000	S	0.3	30.76	7.78	7.4		0	
7/26/2000	S	0.3	28.05	7.2	6.26		0	
8/7/2000	S	0.3	32	7.67	7.5		0	
8/23/2000	S	0.3	29.8	8.01	9.16			
9/13/2000	S	0.3	28.04	7.4	8.55		0	
10/2/2000	S	0.3	22.87	7.53	7.79		0	
10/16/2000	S	0.3	24.22	8.18	9.52		0	
10/30/2000	S	0.3	22.98	7.83	7.89		0	
5/7/2001	S	0.3	25.76	8.03	8.39			
5/30/2001	S	0.3	20.6	7.4	8.8			
6/13/2001	S	0.3	31.06	8.04	8.25		0	
6/28/2001	S	0.3	31.85	7.77	8.48			
90th Percentile			**33.2**	**8.0**				
10th Percentile			**20.2**	**7.1**				

Ambient Water Quality Data for Hardness at 2-JMS099.30						
				HARDNESS, (mg/L AS CACO3)		
Collection Date	**Depth Desc**	**Depth**	**Container Id Desc**	**Value**		
06/18/1992 16:50	S	0.3	R	68		
07/20/1992 15:30	S	0.3	R	82		
09/01/1992 14:35	S	0.3	R	88		
11/17/1992 14:48	S	0.3	R	62		
12/15/1992 15:25	S	0.3	R	33		
01/14/1993 14:50	S	0.3	R	46		
02/09/1993 14:15	S	0.3	R	58		
06/02/1993 13:30	S	0.3	R	0		
08/18/1993 14:10	S	0.3	R	70		
09/20/1993 14:15	S	0.3	R	98		
10/05/1993 14:20	S	0.3	R	96		
11/17/1993 14:00	S	0.3	R	94		
12/02/1993 15:05	S	0.3	R	56		
02/17/1994 15:35	S	1	R	42		
03/21/1994 14:55	B	10	R	54		
	S	1	R	54		
04/14/1994 15:20	S	1	R	53		
05/23/1994 16:05	S	1	R	68		
06/09/1994 15:15	S	1	R	72		
09/08/1994 15:00	S	1	R	75		
10/17/1994 15:45	S	1	R	87		
11/30/1994 15:15	S	1	R	75		
12/06/1994 15:55	S	1	R	75		
01/25/1995 15:05	S	1	R	55		
02/27/1995 15:05	S	1	R	60		
03/23/1995 15:50	S	1	R	58		
04/18/1995 15:30	S	1	R	67		
05/23/1995 15:10	S	1	R	45		
06/20/1995 15:40	S	1	R	59		
07/18/1995 15:25	S	1	R	66		
08/23/1995 16:00	S	1	R	90		
09/21/1995 14:45	S	1	R	115		
10/19/1995 15:25	S	1	R	74		
11/20/1995 15:35	S	1	R	73		
12/14/1995 16:00	S	1	R	48		
01/29/1996 15:30	S	1	R	28		
02/20/1996 15:10	S	1	R	56		
03/25/1996 15:10	S	1	R	60		
04/29/1996 11:20	S	1	R	61		
05/15/1996 14:35	S	1	R	56		
06/18/1996 14:50	S	1	R	50		
07/23/1996 15:35	S	1	R	70		
08/20/1996 14:50	S	1	R	89		
09/24/1996 14:55	S	1	R	64		
10/22/1996 14:30	S	1	R	51		
11/19/1996 15:15	S	1	R	61		
12/10/1996 15:25	S	1	R	41		
02/18/1997 15:50	S	1	R	43.3		
03/18/1997 15:20	S	1	R	54		
04/22/1997 15:25	S	1	R	79.9		
05/28/1997 16:00	S	1	R	62.2		
06/24/1997 15:30	S	1	R	66.1		
07/15/1997 15:30	S	1	R	79.4		
08/19/1997 15:10	S	1	R	62.6		
09/23/1997 15:05	S	1	R	75.7		
10/21/1997 15:00	S	1	R	79.1		
11/18/1997 15:15	S	1	R	68.3		
12/10/1997 15:45	S	1	R	74.3		
01/21/1998 15:45	S	1	R	46.8		

Ambient Water Quality Data for Hardness at 2-JMS099.30						
				HARDNESS, (mg/L AS CACO3)		
Collection Date	**Depth Desc**	**Depth**	**Container Id Desc**	**Value**		
02/18/1998 15:00	S	1	R	40.8		
03/17/1998 15:30	S	1	R	44.1		
04/21/1998 15:20	S	1	R	35.1		
05/19/1998 15:25	S	1	R	47.1		
06/23/1998 16:05	S	1	R	64.4		
07/21/1998 15:15	S	1	R	69.6		
08/18/1998 15:25	S	1	R	77.5		
09/22/1998 17:30	S	1	R	89.3		
10/20/1998 16:30	S	1	R	126		
11/18/1998 15:15	S	1	R	102		
12/15/1998 15:30	S	1	R	90		
01/19/1999 15:20	S	1	R	76		
02/23/1999 15:10	S	1	R	60		
03/23/1999 15:30	S	1	R	68		
04/20/1999 16:35	S	1	R	84		
05/20/1999 15:20	S	1	R	60		
06/22/1999 15:15	S	1	R	80.1		
07/20/1999 16:15	S	1	R	96		
08/17/1999 16:00	S	1	R	109		
09/21/1999 16:20	S	1	R	40.9		
10/28/1999 15:10	S	1	R	74.6		
11/18/1999 15:27	S	1	R	62.7		
12/21/1999 15:05	S	1	R	54.1		
01/18/2000 16:15	S	1	S1	55.8		
02/23/2000 14:15	S	1	R	54		
03/28/2000 15:30	S	1	S1	43		
04/24/2000 15:55	S	1	R	40		
05/23/2000 17:20	S	1	R	57		
06/20/2000 16:05	S	1	R	65.6		
07/18/2000 16:35	S	1	R	76		
08/22/2000 15:20	S	1	R	76.4		
09/26/2000 16:20	S	1	R	65.1		
10/24/2000 15:20	S	1	R	86.9		
11/28/2000 16:50	S	1	R	123		
01/23/2001 14:00	S	1	R	47.8		
02/20/2001 13:20	S	1	R	58.9		
03/27/2001 15:00	S	1	R	25.1		
04/24/2001 13:50	S	1	R	47.2		
06/19/2001 14:30	S	1	R	30.9		
07/24/2001 14:40	S	1	R	77.8		
08/21/2001 15:20	S	1	R	62.6		
09/18/2001 16:20	S	1	R	28.3		
10/16/2001 15:00	S	1	S1	200.6		
11/27/2001 15:30	S	1	R	132		
12/12/2001 14:50	S	1	R	137		
01/22/2002 15:25	S	1	R	78.8		
02/19/2002 15:15	S	1	R	54		
03/19/2002 15:30	S	1	R	37.3		
04/16/2002 15:40	S	1	R	57.9		
05/30/2002 16:20	S	1	R	68		
06/25/2002 15:20	S	1	R	94.2		
07/23/2002 15:00	S	1	R	124		
08/13/2002 15:40	S	1	R	151		
09/24/2002 15:40	S	1	R	95.5		
10/22/2002 15:50	S	1	R	121		
11/19/2002 16:10	S	1	R	30.5		
12/10/2002 15:15	S	1	R	34.8		
01/21/2003 15:45	S	1	R	67.9		
02/25/2003 11:13	S	1	R	51.3		
03/18/2003 15:40	S	1	R	48.8		

Ambient Water Quality Data for Hardness at 2-JMS099.30						
				HARDNESS, (mg/L AS CACO3)		
Collection Date	**Depth Desc**	**Depth**	**Container Id Desc**	**Value**		
04/15/2003 17:00	S	1	R	47		
05/27/2003 14:19	S	1	R	43.8		
06/24/2003 14:50	S	1	R	58.7		
07/15/2003 15:00	S	1	R	48.8		
08/26/2003 16:00	S	1	R	52.8		
09/24/2003 15:37	S	1	R	24.9		
10/28/2003 15:30	S	1	R	72.8		
11/18/2003 15:00	S	1	R	50		
12/16/2003 15:00	S	1	R	42		
02/25/2004 15:00	S	1	R	56.4		
03/23/2004 15:20	S	1	R	62.9		
04/20/2004 14:40	S	1	R	51		
05/18/2004 15:00	S	1	R	60		
06/15/2004 15:00	S	1	R	51		
07/20/2004 14:45	S	1	R	66.9		
08/17/2004 15:00	S	1	R	45.5		
09/21/2004 14:45	S	1	R	47.8		
10/19/2004 14:20	S	1	R	36		
11/16/2004 14:45	S	1	R	43		
12/14/2004 15:25	S	1	R	57		
01/26/2005 15:00	S	1	R	56		
02/15/2005 14:40	S	1	R	72		
03/22/2005 15:15	S	1	R	60		
04/19/2005 15:40	S	1	R	54.7		
05/24/2005 14:45	S	1	R	46		
06/21/2005 14:50	S	1	R	74		
07/19/2005 15:00	S	1	R	76		
08/23/2005 15:30	S	1	R	74		
09/20/2005 15:00	S	1	R	114		
10/18/2005 15:20	S	1	R	56		
11/15/2005 14:30	S	1	R	94		
12/21/2005 15:00	S	1	R	53		
01/17/2006 14:45	S	1	S1	69		
02/21/2006 15:10	S	1	R	59		
03/20/2006 15:15	S	1	R	72		
04/26/2006 15:00	S	1	R	52		
05/15/2006 15:00	S	1	R	62		
07/24/2006 14:25	S	1	R	78		
08/22/2006 15:00	S	1	R	88		
10/30/2006 15:10	S	1	R	52		
11/15/2006 14:30	S	1	R	38		
01/24/2007 14:45	S	1	R	58		
Average				**66.0**		

Attachment 6 – Site Visit Memorandum

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
PIEDMONT REGIONAL OFFICE
4949-A Cox Road, Glen Allen, Virginia 23060
(804) 527-5020 Fax (804) 527-5106
www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

Michael P. Murphy
Regional Director

March 14, 2011

Mr. James Grandstaff, Division Director
Henrico Co. Water Reclamation Facility
9101 WRVA Road
Richmond, VA 23231

RE: VPDES Permit No. VA0063690

Dear Mr. Grandstaff:

Enclosed are copies of the Technical and Laboratory inspection reports regarding my site visit of March 2, 2011. You will note that the Laboratory Inspection Report is less comprehensive than those of previous years'. This is the result of the Virginia Department of Laboratory Services (DCLS) taking over most of the laboratory inspection responsibilities in accordance with the Virgina Environmental Laboratory Accreditation Program (VELAP). However, DEQ still retains some responsibility regarding the inspection of field testing and analysis.

I found the Water Reclamation Facility to be performing well and producing a high quality effluent. The transition to BNR technology appears to have proceeded smoothly and without undo complications. The plant was also neat and well groomed. This attention to detail underscores the professionalism exhibited by the operation and maintenance staff I encountered on my tour of the plant.

There are no General or Compliance Recommendations in either Technical or Laboratory Reports. Therefore, you need not respond to this correspondence unless you have information or concerns you would like documented in DEQ's records,

Please express my thanks to Michael Chapman and Michael Henshaw for the assistance they provided me in performing the inspections.

Sincerely,

Charles R. Stitzer
Environmental Inspector

Enclosures (2)

cc: DEQ, PRO – Water Compliance file
DEQ – OWC, Steve Stell
USEPA (through Steve Stell)

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
LABORATORY INSPECTION REPORT

10/01

FACILITY NO:	INSPECTION DATE:	PREVIOUS INSP. DATE:	PREVIOUS EVALUATION:	TIME SPENT:
VA0063690	March 2, 2011	August 19, 2009	Deficiencies in Lab Records and analysis procedures.	24 hours w/ travel & report

NAME/ADDRESS OF FACILITY:	FACILITY CLASS:	FACILITY TYPE:	UNANNOUNCED INSPECTION?
Henrico Co. Water Reclamation Facility 9101 WRVA Road Richmond, VA 23231	(X) MAJOR ( ) MINOR ( ) SMALL ( ) VPA/NDC	(X) MUNICIPAL ( ) INDUSTRIAL ( ) FEDERAL ( ) COMMERCIAL LAB	(X) YES (X) NO FY-SCHEDULED INSPECTION? (X) YES ( ) NO

INSPECTOR(S):	REVIEWERS:	PRESENT AT INSPECTION:
Charles Stitzer	MDare 3-11-11 Kw 3/14/11	Michael Hawthorne

LABORATORY EVALUATION	DEFICIENCIES? Yes	No
LABORATORY RECORDS		X
GENERAL SAMPLING & ANALYSIS		X
LABORATORY EQUIPMENT		X
DISSOLVED OXYGEN ANALYSIS PROCEDURES		X
pH ANALYSIS PROCEDURES		X
TOTAL RESIDUAL CHLORINE ANALYSIS PROCEDURES		X

QUALITY ASSURANCE/QUALITY CONTROL

Y/N	QUALITY ASSURANCE METHOD	PARAMETERS	FREQUENCY
Y	Comparison against Spec/ Standards	TRC	Daily
Y	IDC and 3 point meter calibration	pH	Daily
Y	IDC and check against DO sat. table	DO	Daily

COPIES TO: (X) DEQ - PRO; (X) OWPS; (X) OWNER; (X) EPA-Region III; ( ) Other:

pH Elec

FACILITY #: VA0063690

LABORATORY RECORDS SECTION

LABORATORY RECORDS INCLUDE THE FOLLOWING:

X	SAMPLING DATE	X	ANALYSIS DATE	X	CONT MONITORING CHART
X	SAMPLING TIME	X	ANALYSIS TIME	X	INSTRUMENT CALIBRATION
X	SAMPLE LOCATION	X	TEST METHOD	X	INSTRUMENT MAINTENANCE
				X	CERTIFICATE OF ANALYSIS

WRITTEN INSTRUCTIONS INCLUDE THE FOLLOWING:

X	SAMPLING SCHEDULES	X	CALCULATIONS	X	ANALYSIS PROCEDURES

	YES	NO	N/A
DO ALL ANALYSTS INITIAL THEIR WORK?	X		
DO BENCH SHEETS INCLUDE ALL INFORMATION NECESSARY TO DETERMINE RESULTS?	X		
IS THE DMR COMPLETE AND CORRECT? MONTH(S) REVIEWED: Jan 2011	X		
ARE ALL MONITORING VALUES REQUIRED BY THE PERMIT REPORTED?	X		

GENERAL SAMPLING AND ANALYSIS SECTION

	YES	NO	N/A
ARE SAMPLE LOCATION(S) ACCORDING TO PERMIT REQUIREMENTS?	X		
ARE SAMPLE COLLECTION PROCEDURES APPROPRIATE?	X		
IS SAMPLE EQUIPMENT CONDITION ADEQUATE?	X		
IS FLOW MEASUREMENT ACCORDING TO PERMIT REQUIREMENTS?	X		
ARE COMPOSITE SAMPLES REPRESENTATIVE OF FLOW?	X		
ARE SAMPLE HOLDING TIMES AND PRESERVATION ADEQUATE?	X		
IF ANALYSIS IS PERFORMED AT ANOTHER LOCATION, ARE SHIPPING PROCEDURES ADEQUATE? LIST PARAMETERS AND NAME & ADDRESS OF LAB: **J.R. Reed & Assoc., Newport News, VA**	X		

LABORATORY EQUIPMENT SECTION

	YES	NO	N/A
ARE FIELD EQUIPMENT IN PROPER OPERATING RANGE?	X		
ANNUAL METER THERMISTER CHECKS PERFORMED AND DOCUMENTED? pH 2/10/11	X		
IS THE LABORATORY GRADE WATER SUPPLY ADEQUATE?			N/A
ARE ANALYTICAL BALANCE(S) ADEQUATE?			N/A

LABORATORY INSPECTION REPORT SUMMARY

FACILITY NAME:	FACILITY NO:	INSPECTION DATE:
Henrico County Water Reclamation Facility	VA0063690	March 3, 2011
LABORATORY EVALUATION:	**( ) Deficiencies** **(X) No Deficiencies**	

OVERVIEW

This inspection consisted of a cursory evaluation of select meters for each of the field parameters, interviews with the Chief of Laboratory Operations and Superintendant of Operations, and records reviews.

LABORATORY RECORDS

No deficiencies noted

GENERAL SAMPLING AND ANALYSIS

No deficiencies noted

LABORATORY EQUIPMENT

No deficiencies noted. New Hach LDO meter is now used for DO field measurements

INDIVIDUAL PARAMETERS

No deficiencies noted

ANALYST:	Operators' field meter – Disinfection lab	VPDES NO	VA0063690

Meter: Orion 3 Star by Thermo Scientific Parameter: Hydrogen Ion (pH)
1/08

Method: Electrometric

METHOD OF ANALYSIS:

X	18th Edition of Standard Methods – 4500-H^+ B
	21st or Online Editions of Standard Methods – 4500-H^+ B (00)

	pH is a method-defined analyte so modifications are not allowed. [40 CFR Part 136.6]	Y	N
1)	Is a certificate of operator competence or initial demonstration of capability available for each analyst/operator performing this analysis? **NOTE**: Analyze 4 samples of known pH. May use external source of buffer (different lot/manufacturer than buffers used to calibrate meter). Recovery for each of the 4 samples must be +/- 0.1 SU of the known concentration of the sample. [SM 1020 B.1]	X	
2)	Is the electrode in good condition (no chloride precipitate, scratches, deterioration, etc.)? [2.b/c and 5.b]	X	
3)	Is electrode storage solution in accordance with manufacturer's instructions? [Mfr.]	X	
4)	Is meter calibrated on at least a daily basis using three buffers all of which are at the same temperature? [4.a] **NOTE**: Follow manufacturer's instructions.	X	
5)	After calibration, is a buffer analyzed as a check sample to verify that calibration is correct? Agreement should be within +/- 0.1 SU. [4.a]	X	
6)	Do the buffer solutions appear to be free of contamination or growths? [3.1]	X	
7)	Are buffer solutions within the listed shelf-life or have they been prepared within the last 4 weeks? [3.a]	X	
8)	Is the cap or sleeve covering the access hole on the reference electrode removed when measuring pH? [Mfr.]	X	
9)	For meters with ATC that also have temperature display, is the thermometer verified annually? [SM 2550 B.1]	X	
10)	Is temperature of buffer solutions and samples recorded when determining pH? [4.a]	X	
11)	Is sample analyzed within 15 minutes of collections? [40 CFR Part 136]	X	
12)	Is the electrode rinsed and then blotted dry between reading solutions (Disregard if a portion of the next sample analyzed is used as the rinsing solution.)? [4.a]	X	
13)	Is the sample stirred gently at a constant speed during measurement? [4.b]	X	
14)	Does the meter hold a steady reading after reaching equilibrium? [4.b]	X	
15)	Is a duplicate sample analyzed after every 20 samples if citing 18th or 19th Edition or daily for 20th or 21st Edition? [Part 1020] **NOTE**: Not required for *in situ* samples.	N/A	
16)	Is the pH of duplicate samples within 0.1SU of the original sample? [Part 1020]	N/A	
17)	Is there a written procedure for which result will be reported on DMR (Sample or Duplicate) and is this procedure followed? [DEQ]	N/A	

PROBLEMS: None

ANALYST:	Operators' field meter – Disinfection Lab	VPDES NO.	VA0063690

Instrument: Hach HQ40D

Parameter: Dissolved Oxygen
Method: Laser - LDO
Facility Elevation - 150'

METHOD OF ANALYSIS:

X	MANUFACTURERS INSTRUCTIONS (HACH)

		Y	N
1)	If samples are collected, is collection carried out with a minimum of turbulence and air bubble formation? [SM4500-O B.3; 360.1-3.1]	*In situ*	
2)	If samples are collected, is the sample bottle allowed to overflow several times its volume? [SM4500-O B.3; 360.1-3.1]	*In situ*	
3)	Are meter and electrode operable and providing consistent readings? [Permit]	X	
4)	Is membrane in good condition without trapped air bubbles? [SM 4500-O G.3.b]	N/A	
5)	Is correct filling solution used in electrode? [Mfr.]	N/A	
6)	Is meter calibrated before use or at least daily? [Mfr.]	X	
7)	Is calibration procedure performed according to manufacturer's instructions? [Mfr.]	X	
8)	Are water droplets shaken off the membrane prior to calibration? [Mfr.]	N/A	
9)	Is sample stirred during analysis? [Mfr.]	*In situ*	
10)	Is the sample analysis procedure performed according to manufacturer's instructions? [Mfr.]	X	
11)	Is meter stabilized before reading D.O.? [Mfr.]	X	
12)	Is electrode stored according to manufacturer's instructions? [Mfr.]	X	

COMMENTS: HACH HQ40D a laser based system I employed. #6 Slope is checked daily. If out of range, it is returned to Hach for service.

PROBLEMS: Instrument not viewed during inspection. Information provided by Jane Roos, Operator

ANALYST:	Operators' field meter – Disinfection Lab	VPDES NO.	VA0063690

Instrument: Hach pocket Colorimeter II Parameter: Total Residual Chlorine (TRC)
Method: DPD Colorimetric (HACH Pocket Colorimeter)
1/08

METHOD OF ANALYSIS:

X	HACH Manufacturer's Instructions (Method 8167) plus an edition of *Standard Methods*
X	18th Edition of *Standard Methods* 4500-Cl G
	21st Edition of *Standard Methods* 4500-Cl G (00)

		Y	N
1)	Is a certificate of operator competence or initial demonstration of capability available for each analyst/operator performing this analysis? **NOTE:** Analyze 4 samples of known TRC. Must use a lot number or source that is different from that used to prepare calibration standards. May not use Spec√ ™. [SM 1020 B.1]	X	
2)	Are the DPD PermaChem™ Powder Pillows stored in a cool, dry place? [Mfr.]	X	
3)	Are the pillows within the manufacturer's expiration date? [Mfr.]	X	
4)	Has buffering capability of DPD pillows been checked annually? (Pillows should adjust sample pH to between 6 and 7) [Mfr.]	X	
5)	When pH adjustment is required, is H_2SO_4 or NaOH used? [Hach 11.3.1]	X	
6)	Are cells clean and in good condition? [Mfr]	X	
7)	Is the low range (0.01 mg/L resolution) used for samples containing residuals from 0.2.00 mg/L? [Mfr.]	X	
8)	Is calibration curve developed (may use manufacturer's calibration) with daily verification using a high and a low standard? **NOTE:** My use manufacturer's installed calibration and commercially available chlorine standards for daily calibration verifications. [18th ed 1020 B.5; 21st ed 4020 B.2.b]	X	
9)	Is the 10-mL cell (2.5-cm diameter) used for samples from 0-2.00 mg/L? [Mfr.]	X	
10)	Is meter zeroed correctly by using sample as blank for the cell used? [Mfr.]	X	
11)	Is the instrument cap placed correctly on the meter body when the meter is zeroed and when the sample is analyzed? [Mfr.]	X	
12)	Is the DPD Total Chlorine PermaChem™ Powder Pillow mixed into the sample? [Hach 11.1]	X	
13)	Is the analysis made at least three minutes but not more than six minutes after PermaChem™ Powder Pillow addition? [Hach 11.2]	X	
14)	If read-out is flashing [2.20], is sample diluted correctly, and then reanalyzed? [Hach 1.2 & 2.0]	X	
15)	Are samples analyzed within 15 minutes of collection? [40 CFR Part 136]	X	
16)	Is a duplicate sample analyzed after every 20 samples if citing 18th Edition [SM 1020 B.6] or daily for 21st Edition [SM 4020 B.3.c]?	N/A	
17)	If duplicate sample is analyzed, is the relative percent difference (RPD) ≤ 20? [18th ed. Table 1020 I; 21st ed. DEQ]	N/A	

PROBLEMS: None

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
SAMPLE ANALYSIS HOLDING TIME/CONTAINER/PRESERVATION CHECK SHEET
Revised 10/00 [40 CFR, Part 136.3, Table II]

FACILITY NAME:	**Henrico Water Reclamation Facility**	VPDES NO	**VA0063690**	DATE:	**March 3, 2011**

HOLDING TIMES						SAMPLE CONTAINER				PRESERVATION				
PARAMETER	APPROVED	MET?		LOGGED?		ADEQ. VOLUME		APPROP. TYPE		APPROVED	MET?		CHECKED?	
		Y	N	Y	N	Y	N	Y	N		Y	N	Y	N
BOD5 & CBOD5	48 HOURS									ANALYZE 2 HRS or 4° C				
TSS	7 DAYS									4° C				
FECAL COLIFORM	6 HRS & 2 HRS TO PROCESS									4° C (1 HOUR)+.008% $Na_2S_2O_3$				
pH	15 MIN.	X		X		X		X		N/A				
CHLORINE	15 MIN.	X		X		X		X		N/A				
DISSOLVED 0_2	15 MIN./IN SITU	X		X		In situ		In situ		N/A				
TEMPERATURE	IMMERSION STAB.									N/A				
OIL & GREASE	28 DAYS									4° C+H_2SO_4/HCL pH<2				
AMMONIA	28 DAYS									4° C+H_2S0_4 pH<2 DECHLOR				
TKN	28 DAYS									4° C+H_2S0_4 pH<2 DECHLOR				
NITRATE	48 HOURS									4° C				
NITRATE+NITRITE	28 DAYS									4° C+H_2S0_4 pH<2				
NITRITE	48 HOURS									4° C				
PHOSPHATE, ORTHO	48 HOURS									FILTER, 4° C				
TOTAL PHOS.	28 DAYS									4° C+H_2S0_4 pH<2				
METALS (except Hg)	6 MONTHS									HNO_3 pH<2				
MERCURY	28 DAYS									HNO_3 pH<2				

PROBLEMS:	**NONE**					PROBLEMS:	**NONE**

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Wastewater Facility Inspection Report

Revised 08/2001

Facility Name:	Henrico Co. Water Reclamation Facility	**Facility No.:**	VA0063690
City/County:	Henrico County	**Inspection Agency:**	DEQ / PRO
Inspection Date:	March 3, 2011	**Date Form Completed:**	March 8, 2011
Inspector:	Charles Stitzer	**Time Spent:**	24 hrs. w/ travel & report
Reviewed By:		**Unannounced Insp.?**	Yes
		FY-Scheduled Insp.?	Yes

Present at Inspection: Michael Hawthorne

TYPE OF FACILITY:

Domestic		Industrial	
[ ] Federal	[x] Major	[ ] Major	[ ] Primary
[x] Non-Federal	[ ] Minor	[ ] Minor	[ ] Secondary

Population Served: approx.: 270,000 (reported 2002)

Number of Connections: approx.: unknown

TYPE OF INSPECTION:

[x] Routine — Date of last inspection: August 18, 2009

[ ] Compliance — Agency: DEQ/PRO

[ ] Reinspection

EFFLUENT MONITORING:

Jan 2011:

Average Flow: 38.67 MGD Max Flow: 60.50 MGD pH 6.6-7.1 SU DO: 8.0 mg/L Fecal Coliform 1

Average Conc: CBOD: <QL mg/L TSS: 0.2 mg/L Phos as P: <QL mg/L Ammonia as 0.3 mg/L

Bypasses and Overflows (at WWTP): 0 in 2010 Numerous small discharges from sewerage system lines (clogs, leaks, line breaks, etc) were logged and reported to DEQ.

CHANGES AND/OR CONSTRUCTION

DATA VERIFIED IN PREFACE	[x] Updated	[ ] No changes
Has there been any new construction?	[x] Yes*	[ ] No
If yes, were plans and specifications approved?	[x] Yes	[ ] No* [ ] N/A

DEQ approval date:

(A) PLANT OPERATION AND MAINTENANCE

1. Class and number of licensed operators: Class I – 9, Class II – 3, Class III – 2 Trainees - 3

2. Hours per day plant is staffed: *24 hours/day, 7 days/week*

3.	Describe adequacy of staffing:	[ ] Good	[x] Average	[ ] Poor*
4.	Does the plant have an established program for training personnel?	[x] Yes	[ ] No	
5.	Describe the adequacy of the training program:	[x] Good	[ ] Average	[ ] Poor*
6.	Are preventive maintenance tasks scheduled?	[x] Yes	[ ] No*	
7.	Describe the adequacy of maintenance:	[x] Good	[ ] Average	[ ] Poor*
8.	Does the plant experience any organic/hydraulic overloading?	[x] Yes*	[ ] No	

If yes, identify cause and impact on plant: The Henrico WRF experiences high flows due to I&I in its sewage collection system. The WRF has been able to adequately treat excess flows without major disruption. A Consent Special Order requiring I&I reduction is in place. Improvement has been noted.

9.	Any bypassing since last inspection?	[ ]*	[x] No*	
10.	Is the on-site electric generator operational?	[x] Yes	[ ] No*	[ ] N/A
11.	Is the STP alarm system operational?	[x] Yes	[ ] No*	[ ] N/A
12.	How often is the standby generator exercised?	[ ] Weekly	[x] Monthly	[ ] Other: _____
	Power Transfer Switch?	[ ] Weekly	[x] Monthly	[ ] Other:
	Alarm System?	[ ] Weekly	[ ] Monthly	[x] Other: No set schedule

13. When were the cross connection control devices last tested on the potable water service? There are four 8" Main line backflow preventers (rebuilt in May of 2005). There are 16 others of various smaller sizes throughout the plant. Most were recertified by East Coast Fire Protection Services, Inc. in May of 2010. Some (the rest) RPZs that were found to need replacement were certified in July 2010. DataStream 7i, Maintenance Mgmt. System generates a work order alerting staff when the RPZ's need to be recertified.

14.	Is sludge disposed in accordance with the approved sludge disposal plan?	[x] Yes	[ ] No*	[ ] N/A
15.	Is septage received by the facility?	[x] Yes	[ ] No	
	Is septage loading controlled?	[x] Yes	[ ] No*	[ ] N/A
	Are records maintained?	[x] Yes	[ ] No*	[ ] N/A
16.	Overall appearance of facility:	[x] Good	[ ] Average	[ ] Poor*

Comments:

#3. The addition of new BNR equipment has increased the plant's complexity. Hiring of additional operators is planned. #6. The plant has a Windows based program (Data Stream 7i) for scheduling and tracking. #9. There have been no recent bypasses, however, there is documentation in the compliance files of numerous sewage spills and overflows from throughout the sewage conveyance system. #10 & 12. Two incoming power sources and a backup generator for specific equipment like the Primary Treatment Facility (headworks) and Disinfection. The Power Transfer switch between the 2 sources is tested annually and it is activated routinely (approximately monthly) throughout the year. #11 & 12. Monthly preventive maintenance and calibration is performed on all equipment and systems covered by the alarm system. #13. There are four 8" Main line backflow preventers (rebuilt in May of 2005). There are 16 others of various smaller sizes throughout the plant. #14. Sludge is land applied under contract with Nutri-Blend. #15. A permanent septage receiving station is adjacent to the Preliminary Treatment building.

(B) PLANT RECORDS

1. Which of the following records does the plant maintain?

Operational Logs for each unit process	[x] Yes	[ ] No*	[ ] N/A
Instrument maintenance and calibration	[x] Yes	[ ] No*	[ ] N/A
Mechanical equipment maintenance	[x] Yes	[ ] No*	[ ] N/A
Industrial waste contribution **(Municipal Facilities)**	[x] Yes	[ ] No*	[ ] N/A

2. What does the operational log contain?

Visual Observations	[x] Yes	[ ] No	[ ] N/A
Flow Measurement	[x] Yes	[ ] No	[ ] N/A
Laboratory Results	[x] Yes	[ ] No	[ ] N/A
Process Adjustments	[x] Yes	[ ] No*	[ ] N/A
Control Calculations	[x] Yes	[ ] No	[ ] N/A
Other:			

3. What do the mechanical equipment records contain:

As built plans and specs?	[x] Yes	[ ] No*	[ ] N/A
Spare parts inventory?	[x] Yes	[ ] No*	[ ] N/A
Manufacturer's instructions?	[x] Yes	[ ] No*	[ ] N/A
Equipment/parts suppliers?	[x] Yes	[ ] No*	[ ] N/A
Lubrication schedules?	[x] Yes	[ ] No*	[ ] N/A
Other:			

Comments: None

4. What do the industrial waste contribution records contain: (Applicable to municipal facilities only)

Waste characteristics?	[x] Yes	[ ] No*	[ ] N/A
Locations and discharge types?	[x] Yes	[ ] No*	[ ] N/A
Impact on plant?	[x] Yes	[ ] No*	[ ] N/A
Other:	N/A		

Comments: Jarad Morton, the County's Pretreatment Coordinator, maintains the records.

5. Are the following records maintained at the plant:

Equipment maintenance records	[x] Yes	[ ] No*	[ ] N/A
Operational Log	[x] Yes	[ ] No*	[ ] N/A
Industrial contributor records	[x] Yes	[ ] No*	[ ] N/A
Instrumentation records	[x] Yes	[ ] No*	[ ] N/A
Sampling and testing records	[x] Yes	[ ] No*	[ ] N/A

6. Are records maintained at a different location? [ ] Yes [x] No
   Where are the records maintained? All are available on site.

7. Were the records reviewed during the inspection? [x] Yes [ ] No

8. Are the records adequate and the O & M Manual current? [ ] Yes [x] No* [ ] N/A
   O&M Manual date written:
   Date DEQ approved last O&M: December 29, 2005

9. Are the records maintained for required 3-year period? [x] Yes [ ] No*

Comments: #8 BNR update not yet completed. O&M updates are to be submitted upon completion of all projects.

(C) SAMPLING

1.	Are sampling locations capable of providing representative samples?	[x] Yes	[ ] No*	[ ] N/A
2.	Do sample types correspond to those required by the permit?	[x] Yes	[ ] No*	[ ] N/A
3.	Do sampling frequencies correspond to those required by the permit?	[x] Yes	[ ] No*	[ ] N/A
4.	Are composite samples collected in proportion to flow?	[x] Yes	[ ] No*	[ ] N/A
5.	Are composite samples refrigerated during collection?	[x] Yes	[ ] No*	[ ] N/A
6.	Does plant maintain required records of sampling?	[x] Yes	[ ] No*	[ ] N/A
7.	Does plant run operational control tests?	[x] Yes	[ ] No*	[ ] N/A

Comments: Please see operational control data included with the attached Lab Inspection Report.

(D) TESTING

1. Who performs the testing?
   [x] Plant/ Lab
   [ ] Central Lab
   [x] Commercial Lab - Name: J.R. Reed & Assoc. - Bioassays

If plant performs any testing, complete 2-4.

2.	What method is used for chlorine analysis?	HACH Pocket Colorimeter		
3.	Is sufficient equipment available to perform required tests?	[x] Yes	[ ] No*	[ ] N/A
4.	Does testing equipment appear to be clean and/or operable?	[x] Yes	[ ] No*	[ ] N/A

Comments: Please see enclosed DEQ Laboratory Inspection Report.

(E) FOR INDUSTRIAL FACILITIES W/ TECHNOLOGY BASED LIMITS N/A

1. Is the production process as described in the permit application? (If no, describe changes in comments)
   [ ] Yes [ ] No* [x] N/A
2. Do products and production rates correspond to the permit application? (If no, list differences in comments section)
   [ ] Yes [ ] No* [x] N/A
3. Has the State been notified of the changes and their impact on plant effluent?
   [ ] Yes [ ] No* [x] N/A

Comments: None

FOLLOW UP TO COMPLIANCE RECOMMENDATIONS FROM THE AUGUST 18, 2009 DEQ INSPECTION:

None

FOLLOW UP TO GENERAL RECOMMENDATIONS FROM THE AUGUST 18, 2009 DEQ INSPECTION:

None

INSPECTION REPORT SUMMARY

Compliance Recommendations/Request for Corrective Action:

None.

General Recommendations/Observations:

None

Comments:

The facility is in good condition and is producing and excellent quality effluent. Upgrades to the plant which are necessary to attain consistent compliance with new nutrient effluent limitations are on schedule and are almost complete. Operation staff are mature, knowledgeable, and well trained.

Items evaluated during this inspection include (check all that apply):

[x] Yes	[ ] No		Operational Units
[ ] Yes	[x] No		O & M Manual
[ ] Yes	[x] No		Maintenance Records
[ ] Yes	[x] No	[ ] N/A	Pathogen Reduction & Vector Attraction Reduction
[X] Yes	[ ] No	[ ] N/A	Sludge Disposal Plan
[ ] Yes	[ ] No	[x] N/A	Groundwater Monitoring Plan
[ ] Yes	[x] No	[ ] N/A	Storm Water Pollution Prevention Plan
[x] Yes	[ ] No	[ ] N/A	Permit Special Conditions
[ ] Yes	[x] No	[ ] N/A	Permit Water Quality Chemical Monitoring
[x] Yes	[ ] No	[ ] N/A	Laboratory Records (Field only)

UNIT PROCESS: Screening/Comminution

1.	Number of units:	Manual: 1		Mechanical: 3
	Number of units in operation:	Manual: 0		Mechanical: 2
2.	Bypass channel provided?	[x] Yes	[ ] No	
	Bypass channel in use?	[ ] Yes	[x] No	[ ] N/A
3.	Area adequately ventilated?	[x] Yes	[ ] No*	
4.	Alarm system for equipment failure or overloads?	[x] Yes	[ ] No	[ ] N/A
	If present, is the alarm system operational?	[x] Yes	[ ] No *	[ ] N/A
5.	Proper flow-distribution between units?	[x] Yes	[ ] No *	[ ] N/A
6.	How often are units checked and cleaned?	checked at least 4 times/day and tied into SCADA		
7.	Cycle of operation:	Timer activated equipped with a differential backup		
8.	Volume of screenings removed:	approx. 3 cubic yards of grit and screenings per day		
9.	General condition:	[x] Good	[ ] Fair	[ ] Poor*

Comments : None

UNIT PROCESS: Grit Removal

1. Number of units: 4 basins with 6 grit classifiers
   Number of units in operation: 4 basins – 4 grit classifiers

2. Unit adequately ventilated? [x] Yes [ ] No *

3. Operation of grit collection equipment: [ ] Manual [x] Time clock [ ] Continuous duty

4. Proper flow-distribution between units? [x] Yes [ ] No * [ ] N/A

5. Daily volume of grit removed: approx. 3 cubic yards of grit and screenings per day

6. All equipment operable? [x] Yes [ ] No *

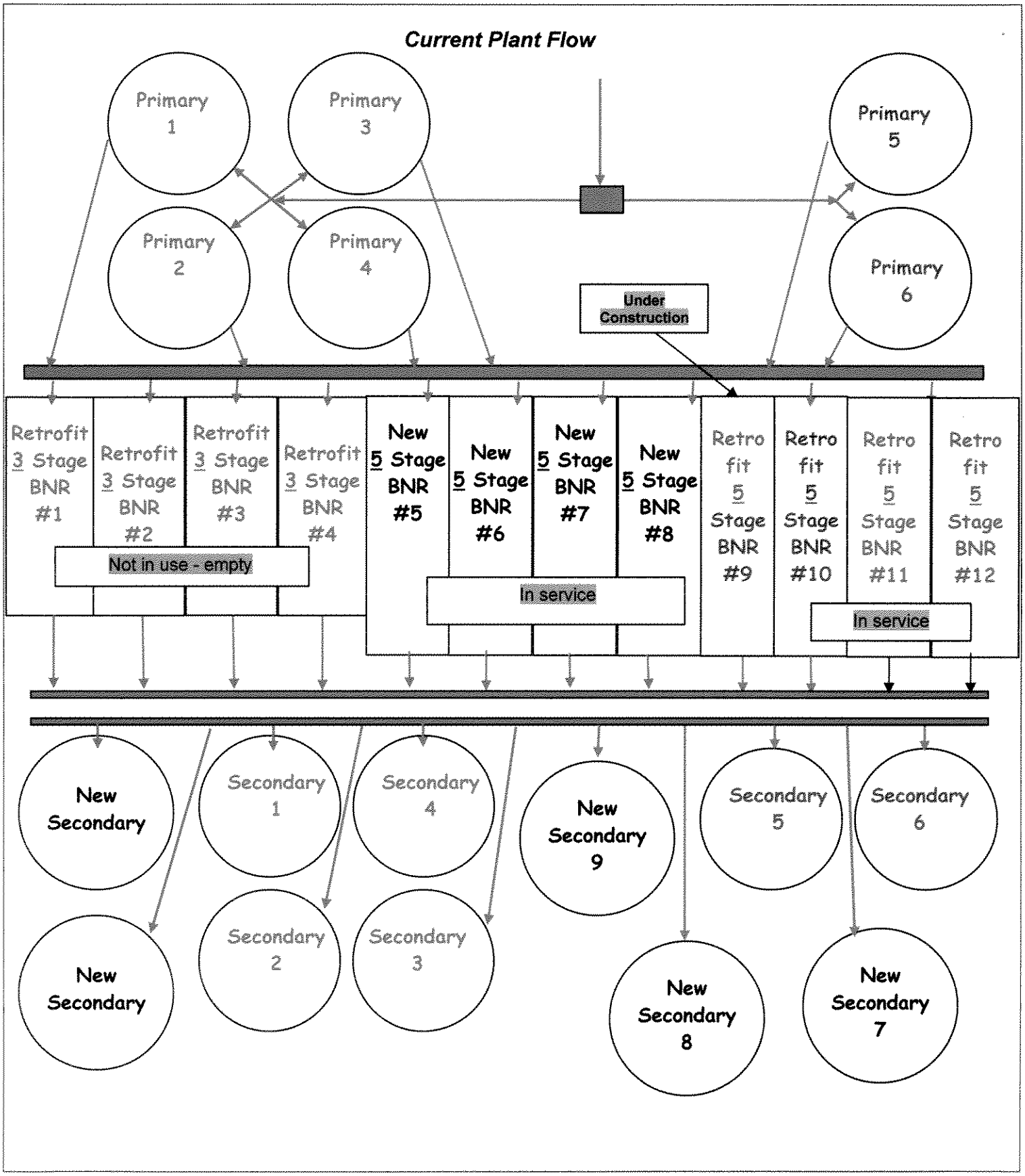
7. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: The grit basins are covered for odor control. 6 grit pumps serve the basins.

UNIT PROCESS: Sewage Pumping

1.	Name of station:	Grit Pumps			
2.	Location (if not at STP):	N/A			
3.	Following equipment operable:				
	a. All pumps?	(6)	[x] Yes	[ ] No*	
	b. Ventilation?		[x] Yes	[ ] No*	[ ] N/A
	c. Control system?		[x] Yes	[ ] No*	[ ] N/A
	d. Sump pump?		[x] Yes	[ ] No*	[ ] N/A
	e. Seal water system?		[x] Yes	[ ] No*	[ ] N/A
4.	Reliability considerations:				
	a. Class		[x] I	[ ] II	[ ] III
	b. Alarm system operable?		[x] Yes	[ ] No	[ ] N/A
	c. Alarm conditions monitored:				
	1. high water level:		[x] Yes	[ ] No*	[ ] N/A
	2. high liquid level in dry well:		[x] Yes	[ ] No*	[ ] N/A
	3. main electric power:		[x] Yes	[ ] No*	[ ] N/A
	4. auxiliary electric power:		[x] Yes	[ ] No*	[ ] N/A
	5. failure of pump motors to start:		[x] Yes	[ ] No*	[ ] N/A
	6. test function:		[x] Yes	[ ] No*	
	7. other:		N/A		
	d. Backup for alarm system operational?		[x] Yes	[ ] No*	[ ] N/A
	e. Alarm signal reported to (identify):		control panel & SCADA		
	f. Continuous operability provisions:				
	1. Generator hook up?		[ ] Yes	[x] No	
	2. Two sources of electricity?		[x] Yes	[ ] No	
	3. Portable pump?		[ ] Yes	[x] No	
	4. 1 day storage?		[ ] Yes	[x] No	
	5. other:		N/A		
5.	Does station have bypass?		[ ] Yes*	[x] No	
	a. Evidence of bypass use?		[ ] Yes*	[ ] No	[x] N/A
	b. Can bypass be disinfected?		[ ] Yes	[ ] No*	[x] N/A
	c. Can bypass be measured?		[ ] Yes	[ ] No*	[x] N/A
6.	How often is station checked?		At least daily, more frequently during high flows		
7.	General condition:		[x] Good	[ ] Fair	[ ] Poor*

Comments: None


Current Plant Flow
Primary 1
Primary 3
Primary 5
Primary 2
Primary 4
Primary 6
Under Construction
Retrofit 3 Stage BNR #1
Retrofit 3 Stage BNR #2
Retrofit 3 Stage BNR #3
Retrofit 3 Stage BNR #4
Not in use - empty
New 5 Stage BNR #5
New 5 Stage BNR #6
New 5 Stage BNR #7
New 5 Stage BNR #8
In service
Retro fit 5 Stage BNR #9
Retro fit 5 Stage BNR #10
Retro fit 5 Stage BNR #11
Retro fit 5 Stage BNR #12
In service
New Secondary
Secondary 1
Secondary 4
New Secondary 9
Secondary 5
Secondary 6
New Secondary
Secondary 2
Secondary 3
New Secondary 8
New Secondary 7

UNIT PROCESS: Sedimentation

[x] Primary [ ] Secondary [ ] Tertiary

1.	Number of units: In operation:	6 in Parallel – 2 recently retrofitted 3		
2.	Proper flow-distribution between units?	[x] Yes	[ ] No*	[ ] N/A
3.	Signs of short-circuiting and/or overloads?	[ ] Yes*	[x] No	
4.	Effluent weirs level? Clean?	[x] Yes [x] Yes	[ ] No* [ ] No*	[ ] N/A
5.	Scum-collection system working properly?	[x] Yes	[ ] No*	[ ] N/A
6.	Sludge-collection system working properly?	[x] Yes	[ ] No*	[ ] N/A
7.	Influent, effluent baffle systems working properly?	[x] Yes	[ ] No*	[ ] N/A
8.	Chemical addition? Chemicals:	[ ] Yes	[x] No	
9.	Effluent characteristics:	*Turbid (typical)*		
10.	General condition:	[x] Good	[ ] Fair	[ ] Poor*

Comments:

The effluent weirs and launders used to be covered to provide odor control, and prevent algal growth. The air from the weirs was vented to the odor control building for treatment. This method of odor control was determined to be unnecessary and the covers have been removed. No strong objectionable odors were detected during the inspection.

UNIT PROCESS: Sludge Pumping

(Primary Sludge to Anaerobic Digesters)

1. Number of Pumps: 9

   Number of pumps in operation: 3

2. Type of sludge pumped: [x] Primary [ ] Secondary [ ] Return Activated [ ] Combination [ ] Other:

3. Type of pump: [ ] Plunger [ ] Diaphragm [ ] Screwlift [ ] Centrifugal [x] Progressing cavity [ ] Other:

4. Mode of operation: [ ] Manual [x] Automatic [ ] Other:

5. Sludge volume pumped: Not checked but estimated to be about 8M gallons in January 2011

6. Alarm system for equipment failures or overloads operational? [x] Yes [ ] No* [ ] N/A

7. General condition: [x] Good [ ] Fair [ ] Poor*

Comments:

These pumps serve the primary clarifiers:

- Pumps 1, 2 & 5 serve clarifiers 1 & 2;
- Pumps 3, 4 & 6 serve clarifiers 3 & 4;
- Pump 7 serves clarifier 6;
- Pump 8 serves clarifier 5;
- Pump 9 serves the scum trough or backup to clarifiers 5 & 6.

#4. The pumps operate on a timer

UNIT PROCESS: Activated Sludge Aeration
(Aeration Basins 1 – 12)

1. Number of units: *12 units in parallel*
   Number of units in operation: *7*

2. Mode of operation: *Biological Nutrient Removal (BNR)*

3. Proper flow distribution between units? [x] Yes [ ] No* [ ] N/A

4. Foam control operational? [ ] Yes [ ] No* [x] N/A

5. Scum control operational? [ ] Yes [ ] No* [x] N/A

6. Evidence of the following problems:
   a. Dead spots? [ ] Yes [x] No*
   b. Excessive foam? [ ] Yes [x] No*
   c. Poor aeration? [ ] Yes [x] No*
   d. Excessive aeration? [ ] Yes [x] No
   e. Excessive scum? [ ] Yes [x] No*
   f. Aeration equipment malfunction? [ ] Yes [x] No*
   g. Other: _____

7. Mixed liquor characteristics (as available) *Not checked this inspection.*

pH:	MLSS:
DO:	SVI:
MLVSS:	Color:
Odor:	Settleability:
	Other:

8. Return/waste sludge: *Jan 2010 daily average*
   a. return rate: *40 MGD - total for all basins*
   b. waste rate: *0.837 MGD - total for all basins*
   c. frequency of wasting: *Continuous*

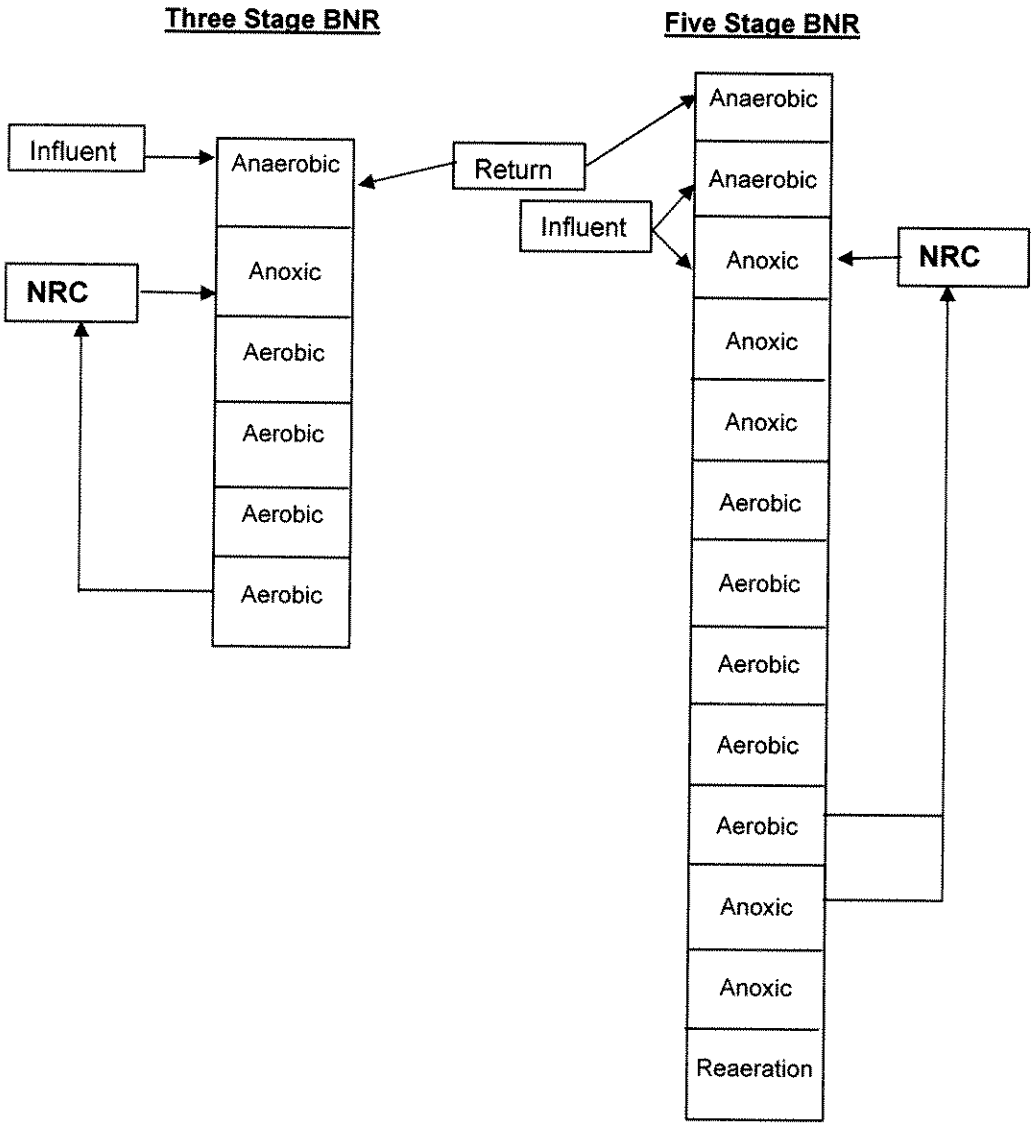
9. Aeration system control: [ ] Time Clock [ ] Manual
   [ ] Continuous [x] Other Automated: continuous monitoring by SCADA

10. Effluent control devices working properly *(oxidation ditches)*? [ ] Yes [ ] No [x] N/A

11. General condition: [x] Good [ ] Fair [ ] Poor *

Comments: The WWTP now has 12 BNR trains - four 3-stage, seven 5-stage and one 5 stage under construction (retro-fit). Aeration is provided by five blowers: three 700 hp and two 1000 hp blowers.

BNR – General Flow Diagram:



UNIT PROCESS: Sedimentation

[ ] Primary [x] Secondary [ ] Tertiary

1. Number of units: 11
   In operation: 7
2. Proper flow-distribution between units? [x] Yes [ ] No* [ ] N/A
3. Signs of short-circuiting and/or overloads? [ ] Yes* [x] No
4. Effluent weirs level? [x] Yes [ ] No* [ ] N/A
   Clean? [x] Yes [ ] No*
5. Scum collection system working properly? [x] Yes [ ] No* [ ] N/A
6. Sludge-collection system working properly? [x] Yes [ ] No* [ ] N/A
7. Influent, effluent baffle systems working properly? [x] Yes [ ] No* [ ] N/A
8. Chemical addition? [ ] Yes [ ] No
   Chemicals: *Alum, Polymer and caustic are added as needed*
9. Effluent characteristics: *Slightly turbid with minor surface scum on one clarifier*
10. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: None

UNIT PROCESS: Sludge Pumping

(RAS)

1. Number of Pumps: 8
   Number of pumps in operation: 3 (on 03/02/11)

2. Type of sludge pumped: [ ] Primary [ ] Secondary [x] Return Activated [ ] Combination [ ] Other:

3. Type of pump: [ ] Plunger [ ] Diaphragm [ ] Screwlift [ ] Centrifugal [ ] Progressing cavity [ ] Other:

4. Mode of operation: [ ] Manual [x] Automatic [ ] Other:

5. Sludge volume pumped: 40 MGD (avg for Jan 2011)

6. Alarm system for equipment failures or overloads operational? [x] Yes [ ] No* [ ] N/A

7. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: None

UNIT PROCESS: Sludge Pumping

(WAS to the Gravity Belt Thickener)

1. Number of Pumps: 2
   Number of pumps in operation: 1

2. Type of sludge pumped: [ ] Primary [ ] Secondary [ ] Return Activated [ ] Combination [x] Other: WAS

3. Type of pump: [ ] Plunger [ ] Diaphragm [ ] Screwlift [ ] Centrifugal [ ] Progressing cavity [ ] Other:

4. Mode of operation: [ ] Manual [ ] Automatic [ ] Other:

5. Sludge volume pumped: 0.387 MGD (avg for Jan 2011).

6. Alarm system for equipment failures or overloads operational? [ ] Yes [ ] No* [ ] N/A

7. General condition: [ ] Good [ ] Fair [ ] Poor*

Comments: July avg.; 34,000 lbs waste sludge produced.

UNIT PROCESS: Flow Equalization
(Excess Flow Basins)

1. Type of unit: [ ] In-line [x] Side-line [ ] Spill Pond
   Number of cells: 1 – 3.3 MG basin
   Number of cells in operation: 0

2. What unit process does it precede? The Primary Clarifiers

3. Is volume adequate? [x] Yes [ ] No

4. Type of mixing: [ ] None [ ] Diffused air [ ] Fixed Mechanical
   [x] Floating mechanical

5. Condition of mixing equipment: [x] Good [ ] Average [ ] Poor*

6. How drawn off?
   a. Pumped from: [ ] Surface [x] Sub-surface [ ] Adjustable [ ] N/A
   b. Weir: [ ] Surface [ ] Sub-surface [x] N/A

7. What is the condition of the containment structure? [x] Good [ ] Fair [ ] Poor*

8. Are the facilities to flush solids and grease from basin walls adequate? [x] Yes [ ] No* [ ] N/A

9. Are there facilities for withdrawing floating material and foam? [ ] Yes [x] No

10. How are solids removed? [x] Drain down [ ] Drag line [ ] Other:_____
    Is it adequate? [x] Yes [ ] No*

11. Is the emergency overflow in good condition? [x] Yes [ ] No* [ ] N/A

12. Are the depth gauges in good condition? [ ] Yes [ ] No [x] N/A

13. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: 2 cells have been demolished. One remains.

UNIT PROCESS: Sewage Pumping

1. Name of station: Excess Flow Basins to Plant Sewer
2. Location (if not at STP): N/A
3. Following equipment operable:

a. All pumps?	(3)	[x] Yes	[ ] No*	
b. Ventilation?		[x] Yes	[ ] No*	[ ] N/A
c. Control system?		[x] Yes	[ ] No*	[ ] N/A
d. Sump pump?		[ ] Yes	[ ] No*	[x] N/A
e. Seal water system?		[ ] Yes	[ ] No*	[x] N/A

4. Reliability considerations:

a. Class	[x] I	[ ] II	[ ] III
b. Alarm system operable?	[x] Yes	[ ] No	[ ] N/A
c. Alarm conditions monitored:			
1. high water level:	[x] Yes	[ ] No*	[ ] N/A
2. high liquid level in dry well:	[ ] Yes	[ ] No*	[x] N/A
3. main electric power:	[x] Yes	[ ] No*	[ ] N/A
4. auxiliary electric power:	[x] Yes	[ ] No*	[ ] N/A
5. failure of pump motors to start:	[x] Yes	[ ] No*	[ ] N/A
6. test function:	[x] Yes	[ ] No*	
7. other:	N/A		
d. Backup for alarm system operational?	[x] Yes	[ ] No*	[ ] N/A
e. Alarm signal reported to (identify):	Control Room & SCADA		
f. Continuous operability provisions:			
1. Generator hook up?	[ ] Yes	[x] No	
2. Two sources of electricity?	[x] Yes	[ ] No	
3. Portable pump?	[ ] Yes	[x] No	
4. 1 day storage?	[ ] Yes	[x] No	
5. other:	N/A		

5. Does station have bypass?

	[ ] Yes*	[x] No	
a. Evidence of bypass use?	[ ] Yes*	[ ] No	[x] N/A
b. Can bypass be disinfected?	[ ] Yes	[ ] No*	[x] N/A
c. Can bypass be measured?	[ ] Yes	[ ] No*	[x] N/A

6. How often is station checked? 2 – 3 times/day

7. General condition:

[x] Good	[ ] Fair	[ ] Poor*

Comments: Basins currently not in use and recent plant expansion has reduced the need for EQ. Basin 1 is available for EQ if needed.

UNIT PROCESS: Floatation Thickening

Tanks now used for blending primary and thickened sludge

1. Number of units: 2

   In of units in operation: 1

2. Floatation-aid system provided? [ ] Yes [ ] No

   Type of aid/dosage: ____

3. Sludge pumping: [x] Manual [ ] Automatic

4. Skimmer blade removal system operating properly? [ ] Yes [ ] No

5. Sludge collection system operating properly? [ ] Yes [ ] No

6. Effluent baffle system working properly? [ ] Yes [ ] No

7. Is the unit used to thicken sludges other than WAS? [ ] Yes [ ] No

   If so, specify other sludge(s):

8. Signs of overloading? [ ] Yes [ ] No

9. Process control testing:

   a. Feed solids testing: [x] Yes [ ] No

   b. Thickened sludge solids testing: [x] Yes [ ] No

   c. Underflow testing: [ ] Yes [x] No

   d. Other (specify): Centrate [x] Yes [x] No

10. Percent capture of solids: Not recorded

11. General condition: [x] Good [x] Fair [ ] Poor

Comments: The flotation units (2) were taken off line and replaced with Gravity Belt Thickeners (GBTs). One flotation thickener basin was retrofitted to be a blend tank for primary and thickened waste activated sludge. An option was built in to allow pre-heating of blended sludge prior to pumping to the digester. One flotation unit was gutted and its structure remains available for future retrofitting, e.g., as a scum concentrator.

UNIT PROCESS: Gravity Thickening
Gravity Belt Thickener

1.	Number of units:	2
	Number of units in operation:	1
2.	Types of sludge(s) fed to the thickener:	[ ] Primary [x] WAS [ ] Combination [ ] Other:____
3.	Solids concentration in the influent sludge:	~10 mg/L
	Solids concentration in thickened sludge:	~5-6 % (avg.)
4.	Sludge feeding:	[ ] Continuous [x] Intermittent
5.	Signs of short-circuiting and/or overloads?	[ ] Yes* [x] No [ ] N/A
6.	Effluent weirs level?	[x] Yes [ ] No * [x] N/A
7.	Sludge collection system work properly?	[x] Yes [ ] No * [ ] N/A
8.	Influent, effluent baffle systems work properly?	[ ] Yes [ ] No * [x] N/A
9.	Chemical addition? Identify chemical/dose:	[x] Yes [ ] No * [ ] N/A Polydyne emulsion
10.	General condition:	[x] Good [ ] Fair [ ] Poor*

Comments: All WAS goes through the GBT prior to the digesters. The unit is cleaned with a water spray daily and cleaned with Tide detergent 1/week.

UNIT PROCESS: Anaerobic Digestion

1. Number of units: 4: 3 Primary and 1 Secondary
   Number of units in operation: 4: 3 Primaries operated in parallel

2. Type of sludge digested: Thickened WAS and Primary

3. Type of digester: [x] Primary (3) [ ] High Rate
   [x] Secondary (1) [x] Standard Rate

4. Frequency of sludge application to digesters: Continuous

5. Number of recirculation pumps: 5
   Number in operation: 3

6. Sludge retention time: 1° digesters - on average ~20 days/month and ~7 days/month in the 2° digesters. Jan. 2011= 26 days in 1°, 9 days in 2°

7. Provisions for pH adjustment? [ ] Yes [x] No
   pH adjustment utilized? [ ] Yes [ ] No [x] N/A

8. Location of supernatant return: [ ] Head [ ] Primary [x] Other: No Supernatant Return

9. Gas production rate: 17,220,062 cu feet in Jan 2011

10. Process control testing:
    a. reduction of volatile solids: [x] Yes [ ] No
    b. volatile acids: [x] Yes [ ] No
    c. pH [x] Yes [ ] No
    d. temperature: [x] Yes [ ] No
    e. alkalinity: [x] Yes [ ] No

11. Signs of overloading? [ ] Yes* [x] No

12. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: The 1° digesters receive thickened WAS from the GBT and 1° Sludge. The heated and mixed 2° digester only receives sludge from the 1° digesters; no raw sludge. Five boilers are present in the digester complex; usually operated 2 at a time. Each unit has 2 recirculation pumps and a new heat exchanger. The old heat exchangers are used to preheat the sludge in the new blend tanks (old DAF units). Three transfer pumps are in place, allowing the digesters to be operated in series if needed.

UNIT PROCESS: Sludge Pumping

(2° Digester to Centrifuges)

1. Number of Pumps: 3 new pumps

   Number of pumps in operation: 0

2. Type of sludge pumped: [ ] Primary [ ] Secondary [ ] Return Activated [ ] Combination

   [x] Other: Digested Primary and WAS

3. Type of pump: [ ] Plunger [ ] Diaphragm [ ] Screwlift

   [ ] Centrifugal [x] Progressing cavity [ ] Other:

4. Mode of operation: [x] Manual [ ] Automatic [ ] Other:

5. Sludge volume pumped: ~2.0 MGD (34.7 MG in Jan 2011)

6. Alarm system for equipment failures or overloads operational? [ ] Yes [ ] No* [x] N/A

7. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: None

UNIT PROCESS: Centrifugation

1.	Number of units: Number in operation:	3 1 at a time. All are operational		
2.	Purpose of centrifuge(s):	[ ] Thickening	[x] Dewatering	[ ] Other:
3.	Operation of equipment:	[x] Manual	[ ] Automatic	[ ] Other:
4.	Centrifuge run time:	One unit - 5 days/week		
5.	Influent sludge flow rate:	0.390 MGD (Jan '11 avg)		
6.	Amount cake produced:	1,089,241 lbs (for Jan '11)		
7.	Percent solids in influent: Percent solids in centrate:	4.2 % (Jan '11 avg) 0.5 % (Jan '11 avg)		
8.	Conditioning chemical fed: Dose:	Cationic Polymer ~ 40 lbs/wet ton		
9	Centrate return location: Sign of problems?	Primary Distribution Chamber [ ] Yes*	[x] No	
10	General Condition:	[x] Good	[ ] Fair	[ ] Poor*

Comments:

The sludge is treated to meet Class B requirements, Pathogen Control Alternative 2, Vector Attraction Reduction Option 1

NutriBlend is contracted to load and haul sludge for land application. Each sludge truck is hosed down on the pad prior to leaving the site.

UNIT PROCESS: Sewage Pumping

1. Name of station: Plant Sewer
2. Location (if not at STP): N/A
3. Following equipment operable:

a. All pumps?	[x] Yes	[ ] No*	
b. Ventilation?	[x] Yes	[ ] No*	[ ] N/A
c. Control system?	[x] Yes	[ ] No*	[ ] N/A
d. Sump pump?	[ ] Yes	[ ] No*	[x] N/A
e. Seal water system?	[ ] Yes	[ ] No*	[x] N/A

4. Reliability considerations:

a. Class	[x] I	[ ] II	[ ] III
b. Alarm system operable?	[x] Yes	[ ] No	[ ] N/A
c. Alarm conditions monitored:			
1. high water level:	[x] Yes	[ ] No*	[ ] N/A
2. high liquid level in dry well:	[ ] Yes	[ ] No*	[x] N/A
3. main electric power:	[x] Yes	[ ] No*	[ ] N/A
4. auxiliary electric power:	[x] Yes	[ ] No*	[ ] N/A
5. failure of pump motors to start:	[x] Yes	[ ] No*	[ ] N/A
6. test function:	[x] Yes	[ ] No*	
7. other:	N/A		
d. Backup for alarm system operational?	[x] Yes	[ ] No*	[ ] N/A
e. Alarm signal reported to (identify):	local audible & visual, and control room		
f. Continuous operability provisions:			
1. Generator hook up?	[ ] Yes	[x] No	
2. Two sources of electricity?	[x] Yes	[ ] No	
3. Portable pump?	[ ] Yes	[x] No	
4. 1 day storage?	[ ] Yes	[x] No	
5. other:	N/A		

5. Does station have bypass?

	[ ] Yes*	[x] No	
a. Evidence of bypass use?	[ ] Yes*	[ ] No	[x] N/A
b. Can bypass be disinfected?	[ ] Yes	[ ] No*	[x] N/A
c. Can bypass be measured?	[ ] Yes	[ ] No*	[x] N/A

6. How often is station checked? a couple of times a day when in use

7. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: The station handles wastewater from plant drains and the excess flow basins. The pumps are operated in lead/lag/standby; alternated weekly.

UNIT PROCESS: Filtration (Tertiary)

1.	Type of filters:	[x] Gravity	[ ] Pressure	[ ] Intermittent
2.	Number of units:	6 – each with 4 cells		
	Number in operation:	20 cells are currently in service (as of 03/02/11)		
3.	Operation of system:	[x] Automatic	[ ] Semi-automatic	
		[ ] Manual	[ ] Other (specify):	
4.	Proper flow-distribution between units?	[x] Yes	[ ] No*	[ ] N/A
5.	Evidence of following problems:			
	a. Uneven flow distribution?	[ ] Yes*	[x] No	[ ] N/A
	b. Filter clogging (ponding)?	[ ] Yes*	[ ] No	[x] N/A
	c. Nozzles clogging?	[ ] Yes*	[ ] No	[x] N/A
	d. Icing?	[ ] Yes*	[ ] No	[x] N/A
	e. Filter flies?	[ ] Yes*	[ ] No	[x] N/A
	f. Vegetation on filter?	[ ] Yes*	[ ] No	[x] N/A
6.	Filter aid system provided?	[x] Yes	[ ] No	
	Properly operating?	[ ] Yes	[ ] No*	[x] N/A
	Chemical used:	The Alum feed system has not been used since 1999.		
7.	Automatic valves properly operating?	[x] Yes	[ ] No*	[ ] N/A
8.	Valves sequencing correctly?	[x] Yes	[ ] No*	[ ] N/A
9.	Backwash system operating properly?	[x] Yes	[ ] No*	[ ] N/A
10.	Filter building adequately ventilated?	[x] Yes	[ ] No*	[ ] N/A
11.	Effluent characteristics:	Very clear		
12.	General condition:	[x] Good	[ ] Fair	[ ] Poor*

Comments: Mono-media filters (anthracite). Filter backwash is activated by timer every 8 hours and/or head pressure. 120,000 gallons of backwash water, per filter, discharges to the four backwash holding basins, which are reconfigured filter basins. The backwash water is then gradually fed back to the plant headworks.

UNIT PROCESS: Chlorination

1.	Number of chlorinators:	1
	Number in operation:	1
2.	Number of evaporators:	0
	Number in operation:	0
3.	Number of chlorine contact tanks:	6
	Number in operation:	3
4.	Proper flow-distribution between units?	[ ] Yes [ ] No * [x] N/A
5.	How is chlorine introduced into the wastewater?	[ ] Perforated diffusers [ ] Injector with single entry point [X] Other (Liquid Hypochlorite injection)
6.	Chlorine residual in basin effluent:	Not checked this inspection
7.	Applied chlorine dosage:	Jan. 2011 average 12,989 lbs/day
8.	Contact basins adequately baffled?	[ ] Yes [ ] No * [x] N/A
9.	Adequate ventilation in:	
	a. Chemical storage area?	[x] Yes [ ] No * [ ] N/A
	b. Equipment room?	[x] Yes [ ] No * [ ] N/A
10.	Proper safety precautions used?	[x] Yes [ ] No *
11.	General condition:	[x] Good [ ] Fair [ ] Poor*

Comments: #5. There are two 27,000 gal. Hypochlorite storage tanks and one 9,000 gal. "day" tank. Hypochlorite solution is injected through 1 injector at the Mix Box #8. The wastewater is in contact with the chlorine from its introduction at the mix box, through the 3° filters and effluent trough, into the new contact tanks. Feed rate is manually adjusted depending on flow, the TRC concentration prior to dechlorination, and ORP values.

The facility also has a permanent RAS chlorination system in place, available when needed.

Operators' pocket colorimeters are checked daily against Spec √ standards

UNIT PROCESS: Dechlorination

1. Chemical used: [ ] Sulfur Dioxide [x] Bisulfite [ ] Other

2. Number of sulfonators: 0
   Number in operation: 0

3. Number of evaporators: 0
   Number in operation: 0

4. Number of chemical feeders: 2
   Number in operation: 1

5. Number of contact tanks: 0
   Number in operation: 0

6. Proper flow-distribution between units? [ ] Yes [ ] No * [x] N/A

7. How is chemical introduced?
   [ ] Perforated diffusers
   [ ] Injector with single entry point
   [x] Other Perforated drip line ahead of the weir at the end of the CCT

8. Control system operational? [x] Yes [ ] No *
   a. Residual analyzers? [ ] Yes [ ] No * [x] N/A
   b. System adjusted: [ ] Automatic [x] Manual [ ] Other:

9. Applied dechlorinating dose: Jan. 2011 average: 4,972 lbs/day

10. Chlorine residual in basin effluent: Not checked

11. Contact basins adequately baffled? [ ] Yes [ ] No * [x] N/A

12. Adequate ventilation in:
    a. Chemical storage area? [x] Yes [ ] No *
    b. Equipment room? [x] Yes [ ] No *

13. Proper safety precautions used? [x] Yes [ ] No *

14. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: There are two 6,000 gallon sodium bisulfite AST's. The sodium bisulfite is introduced into the wastewater at the effluent weir of the chlorine contact tank, as the wastewater is spilling over into the trough.

UNIT PROCESS: Flow Measurement

[ ] Influent [ ] Intermediate [x] Effluent

1.	Type measuring device:	8' channel with ultrasonic sensor and TIRE		
2.	Present reading:	40 MGD @ 1415 03/02/11		
3.	Bypass channel?	[ ] Yes	[x] No	
	Metered?	[ ] Yes	[ ] No*	[x] N/A
4.	Return flows discharged upstream from meter?	[ ] Yes	[x] No	
	If Yes, identify:	N/A		
5.	Device operating properly?	[x] Yes	[ ] No*	
6.	Date of last calibration:	Feb. 28, 2011		
7.	Evidence of following problems:	[ ] Yes*	[x] No	
	a. Obstructions?	[ ] Yes*	[x] No	
	b. Grease?			
8.	General condition:	[x] Good	[ ] Fair	[ ] Poor*

Comments: None

UNIT PROCESS: Effluent/Plant Outfall

1. Type outfall: [ ] Shore based [x] Submerged

2. Type if shore based: [ ] Wingwall [ ] Headwall [ ] Rip Rap [x] N/A

3. Flapper valve? [ ] Yes [ ] No [x] N/A

4. Erosion of bank? [ ] Yes* [ ] No [x] N/A

5. Effluent plume visible? [ ] Yes * [ ] No Outfall was not observed.

Comments: The effluent was clear at the end of the CCT.

6. Condition of outfall and supporting structures: [ ] Good [ ] Fair [ ] Poor * Not Observed

7. Final effluent, evidence of following problems: The outfall was not visited; the following observations are based on the condition of the contact tank overflow.

   a. Oil sheen? [ ] Yes* [x] No
   b. Grease? [ ] Yes* [x] No
   c. Sludge bar? [ ] Yes* [x] No
   d. Turbid effluent? [ ] Yes* [x] No
   e. Visible foam? [ ] Yes* [x] No
   f. Unusual odor? [ ] Yes* [x] No

Comments: None

cc:

[x] Owner: c/o James Grandstaff, Director
[x] Chief of Lab Operations: Lola Guerra
[x] Chief of Operations: Michael Chapman
[x] DEQ - OWCP, attn: Steve Stell
[x] DEQ - Regional Office File
[x] EPA - Region III (through Steve Stell, OWCP)

Attachment 7 – Effluent Data

PH (S.U.)

Date	Min	Max
10-Jan-06	6.4	7.2
10-Feb-06	6.5	6.9
09-Mar-06	6.5	7.3
11-Apr-06	6.6	7.2
11-May-06	6.7	6.9
13-Jun-06	6.5	7.1
11-Jul-06	6.6	7.2
09-Aug-06	6.5	7.4
12-Sep-06	6.7	7.4
10-Oct-06	6.6	7.4
13-Nov-06	6.4	7.4
11-Dec-06	6	7.1
09-Jan-07	6.3	6.6
14-Feb-07	6.2	7
13-Mar-07	6.2	6.5
11-Apr-07	6.1	6.6
10-May-07	6.2	6.8
12-Jun-07	6.2	6.8
11-Jul-07	6.6	6.9
08-Aug-07	6.6	7.1
12-Sep-07	6.6	7
12-Oct-07	6.7	7.1
09-Nov-07	6.5	7.1
11-Dec-07	6.6	7
11-Jan-08	6.4	7
11-Feb-08	6.3	6.8
11-Mar-08	6.2	6.7
11-Apr-08	6.2	6.6
12-May-08	6	6.7
10-Jun-08	6.2	6.6
10-Jul-08	6.4	6.8
08-Aug-08	6.4	6.8
10-Sep-08	6.1	6.8
09-Oct-08	6.2	6.7
10-Nov-08	6.3	6.8
09-Dec-08	6.3	6.8
08-Jan-09	6.1	6.6
09-Feb-09	6.3	6.6
09-Mar-09	6.4	6.7
08-Apr-09	6.2	6.6
11-May-09	6.1	6.5
10-Jun-09	6.7	7.2
10-Jul-09	6.7	7.1
11-Aug-09	6.9	7.3
10-Sep-09	7	7.5
13-Oct-09	6.9	7.5
09-Nov-09	7	7.4
10-Dec-09	6.5	7.3
08-Jan-10	6.4	6.8
10-Feb-10	6.5	7
09-Mar-10	6.6	7.2
12-Apr-10	6.4	7.4
07-May-10	6.4	7.3
08-Jun-10	6.8	7.8
09-Jul-10	6.8	7.3
09-Aug-10	6.8	7.4
09-Sep-10	6.8	7.8
07-Oct-10	6.9	7.3
09-Nov-10	6.6	7.2
09-Dec-10	6.5	7.1
07-Jan-11	6.7	7.2
10-Feb-11	6.6	7.1
09-Mar-11	6.5	7
90th Percentile	6.8	7.4
10th Percentile	6.2	6.6

TSS (mg/L)

Date	Monthly Avg	Weekly Avg
10-Jan-06	1.2	1.6
10-Feb-06	<QL	1.3
09-Mar-06	<QL	1
11-Apr-06	<QL	<QL
11-May-06	<QL	<QL
13-Jun-06	<QL	<QL
11-Jul-06	<QL	<QL
09-Aug-06	<QL	1.3
12-Sep-06	<QL	<QL
10-Oct-06	<QL	1.1
13-Nov-06	<QL	1
11-Dec-06	<QL	<QL
09-Jan-07	<QL	<QL
14-Feb-07	2.5	3.9
13-Mar-07	2.4	3.7
11-Apr-07	1.1	1.2
10-May-07	1	1.8
12-Jun-07	1.1	2.1
11-Jul-07	1	1.4
08-Aug-07	0.5	1
12-Sep-07	1.1	1.5
12-Oct-07	2.1	2.6
09-Nov-07	0.8	1.2
11-Dec-07	1.1	1.4
11-Jan-08	0.5	1.1
11-Feb-08	0.9	1.2
11-Mar-08	1.9	2.1
11-Apr-08	1.8	2.9
12-May-08	1.8	2
10-Jun-08	1.7	2.2
10-Jul-08	1.1	2
08-Aug-08	1	1.1
10-Sep-08	2.2	2.7
09-Oct-08	1	2.4
10-Nov-08	0.032	0
09-Dec-08	0.51	0.8
08-Jan-09	1.4	2.1
09-Feb-09	0.18	0.2
09-Mar-09	0.25	0.47
08-Apr-09	1.45	3.63
11-May-09	1.08	1.81
10-Jun-09	0.28	0.79
10-Jul-09	0.34	0.39
11-Aug-09	2.7	3.99
10-Sep-09	2.5	4.6
13-Oct-09	0.2	0.6
09-Nov-09	0.4	0.8
10-Dec-09	1	2.4
08-Jan-10	0.8	1.2
10-Feb-10	1.4	2.8
09-Mar-10	2.1	2.9
12-Apr-10	20	14.2
07-May-10	2.8	5
08-Jun-10	0.7	1.2
09-Jul-10	0.9	1
09-Aug-10	1.1	1.5
09-Sep-10	0.3	0.7
07-Oct-10	0.5	0.4
09-Nov-10	0.2	0.3
09-Dec-10	<QL	<QL
07-Jan-11	0.7	1.7
10-Feb-11	0.2	0.4
09-Mar-11	0.2	0.6
Average	1.48044	1.9141818

CBOD5 (mg/L)

Date	Monthly Avg	Weekly Avg
10-Feb-06	<QL	<QL
09-Mar-06	<QL	<QL
11-Apr-06	2.1	2.9
11-May-06	<QL	2.6
13-Jun-06	<QL	2.5
11-Dec-06	<QL	<QL
09-Jan-07	<QL	<QL
14-Feb-07	2.5	3.7
13-Mar-07	3.9	4.6
11-Apr-07	2.9	3.2
10-May-07	3.1	4
12-Jun-07	1.5	1.9
11-Dec-07	2	2.9
11-Jan-08	2.1	5.7
11-Feb-08	0.9	1.7
11-Mar-08	1.8	1.9
11-Apr-08	4	8.2
12-May-08	2.6	3
10-Jun-08	2.5	3.1
09-Dec-08	2.3	3.2
08-Jan-09	1.2	1.8
09-Feb-09	0.7	1.5
09-Mar-09	2.1	2.5
08-Apr-09	2.7	4.5
11-May-09	2.4	2.7
10-Jun-09	1.7	2
10-Dec-09	0.6	1.4
08-Jan-10	0.5	1
10-Feb-10	1	1.8
09-Mar-10	1.5	2.9
12-Apr-10	7.6	5.9
07-May-10	3.1	4.2
08-Jun-10	2.1	3.1
09-Dec-10	<QL	<QL
07-Jan-11	0.1	0.3
10-Feb-11	<QL	<QL
09-Mar-11	0.4	0.6
10-Jan-06	NR	NR
11-Jul-06	2.9	3.3
09-Aug-06	2.6	2.8
12-Sep-06	2.6	3.1
10-Oct-06	<QL	<QL
13-Nov-06	2.1	2.4
11-Jul-07	2	2.8
08-Aug-07	1.8	2.5
12-Sep-07	1.7	3.4
12-Oct-07	2.4	2.6
09-Nov-07	2.1	3.9
10-Jul-08	3	4.1
08-Aug-08	2.4	2.5
10-Sep-08	3.1	3.9
09-Oct-08	1.9	2.9
10-Nov-08	2.3	2.7
10-Jul-09	1.4	3.2
11-Aug-09	2.9	3.3
10-Sep-09	3.2	3.9
13-Oct-09	1.2	2
09-Nov-09	1.1	1.9
09-Jul-10	2.5	2.7
09-Aug-10	2.7	3.7
09-Sep-10	0.8	1.4
07-Oct-10	0.8	1.2
09-Nov-10	0.4	0.9
Average	2.109433962	2.88

COLIFORM, FECAL (N/100 mL)

Date	Average	Max
10-Jan-06	1	NULL
10-Feb-06	<QL	<QL
09-Mar-06	<QL	<QL
11-Apr-06	<QL	<QL
11-May-06	<QL	<QL
13-Jun-06	<QL	<QL
11-Jul-06	<QL	<QL
09-Aug-06	<QL	<QL
12-Sep-06	<QL	<QL
10-Oct-06	<QL	<QL
13-Nov-06	<QL	<QL
11-Dec-06	<QL	<QL
09-Jan-07	<QL	<QL
14-Feb-07	<QL	<QL
13-Mar-07	<1	<1
11-Apr-07	1	3
10-May-07	<1	<1
12-Jun-07	<1	<1
11-Jul-07	1	1
08-Aug-07	1	1
12-Sep-07	1	1
12-Oct-07	1	4
09-Nov-07	1	1
11-Dec-07	1	1
11-Jan-08	1	1
11-Feb-08	1	1
11-Mar-08	<1	<1
11-Apr-08	1	1
12-May-08	1	1
10-Jun-08	1	0
10-Jul-08	0.57	0.9
08-Aug-08	0.55	0.61
10-Sep-08	0.52	0.55
09-Oct-08	0.52	0.5
10-Nov-08	0.5	0.5
09-Dec-08	0.5	0.5
08-Jan-09	0.5	0.5
09-Feb-09	0.5	0.5
09-Mar-09	0.5	0.6
08-Apr-09	0.53	0.55
11-May-09	0.5	0.5
10-Jun-09	0.7	1.4
10-Jul-09	0.5	0.5
11-Aug-09	0.6	0.55
10-Sep-09	1	1
13-Oct-09	1	1
09-Nov-09	1	1
10-Dec-09	1	1
08-Jan-10	1	1
10-Feb-10	1	1
09-Mar-10	1	1
12-Apr-10	1	1
07-May-10	1	1
08-Jun-10	1	1
09-Jul-10	1	1
09-Aug-10	1	1
09-Sep-10	1	1
07-Oct-10	1	1
09-Nov-10	1	1
09-Dec-10	1	1
07-Jan-11	1	1
10-Feb-11	1	1
09-Mar-11	1	1
Average	0.858478	0.9702

DO (mg/L)

Date	Min
10-Jan-06	5.9
10-Feb-06	6.9
09-Mar-06	6.6
11-Apr-06	6.5
11-May-06	7.3
13-Jun-06	6.5
11-Jul-06	5.9
09-Aug-06	6.1
12-Sep-06	6.1
10-Oct-06	6.2
13-Nov-06	4.8
11-Dec-06	6.5
09-Jan-07	6
14-Feb-07	6.8
13-Mar-07	8
11-Apr-07	7.1
10-May-07	7.5
12-Jun-07	8.1
11-Jul-07	7.5
08-Aug-07	6.7
12-Sep-07	7.3
12-Oct-07	6.8
09-Nov-07	7
11-Dec-07	7.9
11-Jan-08	7.9
11-Feb-08	8.8
11-Mar-08	8.2
11-Apr-08	8
12-May-08	4.1
10-Jun-08	7
10-Jul-08	7.4
08-Aug-08	7
10-Sep-08	6.7
09-Oct-08	6.5
10-Nov-08	7.1
09-Dec-08	7
08-Jan-09	7.5
09-Feb-09	8.2
09-Mar-09	7.7
08-Apr-09	7.1
11-May-09	7.7
10-Jun-09	6.8
10-Jul-09	7.2
11-Aug-09	7.6
10-Sep-09	7
13-Oct-09	7.2
09-Nov-09	7.9
10-Dec-09	7
08-Jan-10	5.7
10-Feb-10	7.3
09-Mar-10	6.5
12-Apr-10	6.5
07-May-10	7.6
08-Jun-10	7.7
09-Jul-10	7.4
09-Aug-10	7.1
09-Sep-10	7.3
07-Oct-10	6.9
09-Nov-10	6.2
09-Dec-10	7.7
07-Jan-11	7.8
10-Feb-11	8
09-Mar-11	9
Average	7.068253968

AMMONIA as N (mg/L)

Date	Monthly Avg	Weekly Avg
10-Feb-06	0.5	0.7
09-Mar-06	0.6	1
11-Apr-06	0.9	0.8
11-May-06	<QL	<QL
13-Jun-06	<QL	<QL
11-Dec-06	<QL	0.2
09-Jan-07	0.8	1.5
14-Feb-07	2.1	3.1
13-Mar-07	0.1	0.3
11-Apr-07	0.3	0.7
10-May-07	0.2	0.3
12-Jun-07	0.1	0.2
11-Dec-07	0.1	0.5
11-Jan-08	0.1	0.1
11-Feb-08	0.1	0.2
11-Mar-08	0.9	0.5
11-Apr-08	0.5	0.9
12-May-08	0.2	0.3
10-Jun-08	0.3	0.8
09-Dec-08	0.9	1.3
08-Jan-09	0.4	0.8
09-Feb-09	1.3	1.7
09-Mar-09	0.9	2.1
08-Apr-09	1.9	3.3
11-May-09	0.2	0.4
10-Jun-09	0.07	0.33
10-Dec-09	0.4	0.8
08-Jan-10	1.5	1.8
10-Feb-10	3.2	4.1
09-Mar-10	5.1	6.5
12-Apr-10	7.6	9.6
07-May-10	0.4	0.4
08-Jun-10	0.2	0.4
09-Dec-10	<QL	<QL
07-Jan-11	0.1	0.2
10-Feb-11	0.3	0.9
09-Mar-11	0.08	0.2
10-Jan-06	NR	NR
11-Jul-06	0.2	0.5
09-Aug-06	<QL	<QL
12-Sep-06	<QL	<QL
10-Oct-06	<QL	<QL
13-Nov-06	<QL	<QL
11-Jul-07	0.1	0.5
08-Aug-07	1	<QL
12-Sep-07	0.1	0.5
12-Oct-07	0.01	0.03
09-Nov-07	0.2	0.4
10-Jul-08	0.6	1.1
08-Aug-08	1.2	1.3
10-Sep-08	0.1	0.6
09-Oct-08	1.2	2.4
10-Nov-08	1.6	2
10-Jul-09	1.3	1.7
11-Aug-09	0.26	0.27
10-Sep-09	0.9	1.3
13-Oct-09	0.1	0.2
09-Nov-09	0.1	0.2
09-Jul-10	1.1	2
09-Aug-10	1.5	2.4
09-Sep-10	1.7	5.9
07-Oct-10	0	0
09-Nov-10	0	0.1
Average	0.844814815	1.30240741

CL2, TOTAL (ug/L)

Date	Average	Max
10-Feb-06	<QL	<QL
09-Mar-06	<QL	<QL
11-Apr-06	<QL	<QL
11-May-06	<QL	<QL
13-Jun-06	<QL	<QL
11-Jul-06	3	13
09-Aug-06	<QL	<QL
12-Sep-06	<QL	<QL
10-Oct-06	<QL	<QL
13-Nov-06	<QL	<QL
11-Dec-06	<QL	<QL
09-Jan-07	<QL	<QL
14-Feb-07	<QL	<QL
13-Mar-07	<QL	<QL
11-Apr-07	<QL	<QL
10-May-07	<QL	<QL
12-Jun-07	<QL	<QL
11-Jul-07	<QL	<QL
08-Aug-07	<QL	<QL
12-Sep-07	<QL	<QL
12-Oct-07	3	14
09-Nov-07	2	<QL
11-Dec-07	<QL	<QL
11-Jan-08	<QL	<QL
11-Feb-08	<QL	<QL
11-Mar-08	<QL	<QL
11-Apr-08	<QL	<QL
12-May-08	<QL	<QL
10-Jun-08	12	20
10-Jul-08	<QL	<QL
08-Aug-08	11	26
10-Sep-08	19	26
09-Oct-08	13	22
10-Nov-08	8	12
09-Dec-08	13	20
08-Jan-09	20	27
09-Feb-09	21	27
09-Mar-09	21	26
08-Apr-09	15	21
11-May-09	16	17
10-Jun-09	15	23
10-Jul-09	14	18
11-Aug-09	13	17
10-Sep-09	16	19
13-Oct-09	13	19
09-Nov-09	19	26
10-Dec-09	20	27
08-Jan-10	21	27
10-Feb-10	16	36
09-Mar-10	13	28
12-Apr-10	7	11
07-May-10	17	23
08-Jun-10	13	17
09-Jul-10	10	13
09-Aug-10	8	10
09-Sep-10	11	19
07-Oct-10	11	13
09-Nov-10	13	23
09-Dec-10	12	14
07-Jan-11	11	16
10-Feb-11	15	20
09-Mar-11	18	23
Average	13.41667	20.371

CL2, TOTAL CONTACT and INST TECH MIN LIMIT (mg/L)

Date	Min
10-Jan-06	0.6
10-Feb-06	0.8
09-Mar-06	0.9
11-Apr-06	0.7
11-May-06	0.7
13-Jun-06	0.9
11-Jul-06	0.7
09-Aug-06	0.7
12-Sep-06	0.6
10-Oct-06	0.8
13-Nov-06	0.8
11-Dec-06	0.9
09-Jan-07	0.6
14-Feb-07	0.7
13-Mar-07	0.8
11-Apr-07	0.7
10-May-07	0.7
12-Jun-07	0.6
11-Jul-07	0.6
08-Aug-07	0.7
12-Sep-07	0.6
12-Oct-07	0.7
09-Nov-07	0.7
11-Dec-07	0.7
11-Jan-08	0.9
11-Feb-08	0.8
11-Mar-08	0.9
11-Apr-08	0.2
12-May-08	0.7
10-Jun-08	0.3
10-Jul-08	0.8
08-Aug-08	0.7
10-Sep-08	0.39
09-Oct-08	0.7
10-Nov-08	0.69
09-Dec-08	0.7
08-Jan-09	0.73
09-Feb-09	0.78
09-Mar-09	0.7
08-Apr-09	1
11-May-09	0.7
10-Jun-09	0.81
10-Jul-09	0.74
11-Aug-09	0.68
10-Sep-09	0.7
13-Oct-09	0.75
09-Nov-09	0.7
10-Dec-09	0.1
08-Jan-10	0.9
10-Feb-10	1
09-Mar-10	0.9
12-Apr-10	0.8
07-May-10	0.9
08-Jun-10	0.8
09-Jul-10	0.7
09-Aug-10	0.8
09-Sep-10	0.7
07-Oct-10	0.6
09-Nov-10	0.8
09-Dec-10	0.6
07-Jan-11	0.7
10-Feb-11	0.72
09-Mar-11	0.85
Average	0.716507937

PHOSPHORUS, TOTAL AS P (mg/L)

Date	Conc Avg
10-Jan-06	1.1
10-Feb-06	1.4
09-Mar-06	1.4
11-Apr-06	1.4
11-May-06	1.5
13-Jun-06	1.4
11-Jul-06	1
09-Aug-06	1
12-Sep-06	0.7
10-Oct-06	0.4
13-Nov-06	0.3
11-Dec-06	0.2
09-Jan-07	0.3
14-Feb-07	0.6
13-Mar-07	0.7
11-Apr-07	0.7
10-May-07	0.7
12-Jun-07	0.6
11-Jul-07	0.5
08-Aug-07	0.1
12-Sep-07	0.1
12-Oct-07	0.04
09-Nov-07	0.004
11-Dec-07	0.04
11-Jan-08	0.03
11-Feb-08	0.03
11-Mar-08	0.5
11-Apr-08	0.2
12-May-08	0.3
10-Jun-08	0.5
10-Jul-08	0.24
08-Aug-08	0.1
10-Sep-08	0.33
09-Oct-08	0.19
10-Nov-08	0.02
09-Dec-08	0.02
08-Jan-09	0.2
09-Feb-09	0.38
09-Mar-09	0.19
08-Apr-09	0.28
11-May-09	0.05
10-Jun-09	0.54
10-Jul-09	0.9
11-Aug-09	0.13
10-Sep-09	0.3
13-Oct-09	0
09-Nov-09	0.1
10-Dec-09	0.1
08-Jan-10	0.2
10-Feb-10	0.1
09-Mar-10	0.2
12-Apr-10	0.7
07-May-10	0.3
08-Jun-10	0.4
09-Jul-10	0.1
09-Aug-10	0.1
09-Sep-10	0
07-Oct-10	0
09-Nov-10	0
09-Dec-10	<QL
07-Jan-11	0
10-Feb-11	<QL
09-Mar-11	<QL
Average	0.398566667

Form 2A-Part D (mg/L)

	Pollutant	Average	Max	ML/MDL
Metals	Antimony, total recoverable	<0.06	<0.08	0.08
	Arsenic, total recoverable	<0.04	<0.06	0.06
	Beryllium, total recoverable	<0.004	<0.005	0.005
	Cadmium, total recoverable	<0.0002	<0.0005	0.0001
	Chromium, total recoverable	<0.01	<0.01	0.01
	Copper, total recoverable	<0.004	<0.005	0.005
	Lead, total recoverable	<0.02	<0.02	0.02
	Mercury, total recoverable	<0.000003	<0.000003	0.000003
	Nickel, total recoverable	<0.01	<0.01	0.01
	Selenium, Total Recoverable	<0.003	<0.005	<0.002
	Silver, total recoverable	<0.0005	<0.001	0.0002
	Thallium, total recoverable	<0.03	<0.04	0.04
	Zinc, total recoverable	0.029	0.031	0.015
	Cyanide	<0.01	<0.01	0.01
	Total phenolic compounds	<0.04	<0.05	0.05
	Hardness	83.9	91	1/0.2
Volatiles	Acrolein	<0.04	<0.05	0.05
	Acrylonitrile	<0.02	0.05	0.01
	Benzene	<0.01	<0.01	0.01
	Bromoform	<0.01	<0.01	0.01
	Carbon Tetrachloride	<0.01	<0.01	0.01
	Chlorobenzene	<0.01	<0.01	0.01
	Chlorodibromomethane	<0.01	<0.01	0.01
	Chloroethane	<0.01	<0.01	0.01
	2-Chloro-ethhylvinyl ether	<0.01	<0.01	0.01
	Chloroform	<0.01	<0.01	0.01
	Dichlorobromomethane	<0.01	<0.01	0.01
	1,1-Dichloroethane	<0.01	<0.01	0.01
	1,2-Dichloroethane	<0.01	<0.01	0.01
	Trans-1,2-dichloroethylene	<0.01	<0.01	0.01
	1,1-Dichloroethylene	<0.01	<0.01	0.01
	1,2-Dichloropropane	<0.01	<0.01	0.01
	1,3-Dichloropropylene	<0.01	<0.01	0.01
	Ethylbenzene	<0.01	<0.01	0.01
	Methyl Bromide	<0.01	<0.01	0.01
	Methyl Chloride	<0.01	<0.01	0.01
	Methylene Chloride	<0.01	<0.01	0.01
	1,1,2,2-Tetrachloroethane	<0.01	<0.01	0.01
	Tetrachloroethylene	<0.01	<0.01	0.01
	Toluene	<0.01	<0.01	0.01
	1,1,1-Trichloroethane	<0.01	<0.01	0.01
	1,1,2-Trichloroethane	<0.01	<0.01	0.01
	Trichloroethylene	<0.01	<0.01	0.01
	Vinyl Chloride	<0.01	<0.01	0.01
Acid Extractable	P-Chloro-M-Cresol	<0.01	<0.01	0.01
	2-Chlorophenol	<0.01	<0.01	0.01
	2,4 Dichlorophenol	<0.01	<0.01	0.01
	2,4 Dimethylphenol	<0.01	<0.01	0.01
	4,6-Dinitro-O-Cresol	<0.01	<0.01	0.01
	2,4-Dinitrophenol	<0.01	<0.01	0.01
	2-Nitrophenol	<0.01	<0.01	0.01
	4-Nitrophenol	<0.01	<0.01	0.01
	Pentachlorophenol	<0.01	<0.01	0.01
	Phenol	<0.01	<0.01	0.01
	2,4,6-Trichlorophenol	<0.01	<0.01	0.01
Base-Neutral Compounds	Acenaphthene	<0.01	<0.01	0.01
	Acenaphthylene	<0.01	<0.01	0.01
	Anthracene	<0.01	<0.01	0.01
	Benzidine	<0.01	<0.01	0.01
	Benzo (a) anthracene	<0.01	<0.01	0.01
	Benzo (a) pyrene	<0.01	<0.01	0.01
	3,4 Benzo-Fluoranthene	<0.01	<0.01	0.01

Form 2A-Part D (mg/L)

Pollutant	Average	Max	ML/MDL
Benzo(ghi)perylene	<0.01	<0.01	0.01
Benzo (k) fluoranthene	<0.01	<0.01	0.01
Benzo (2-Chloroethoxy) Methane	<0.01	<0.01	0.01
Bis (2-Chloroethyl) Ether	<0.01	<0.01	0.01
Bis 2-Chloroisopropyl Ether	<0.01	<0.01	0.01
Bis (2-Ethylhexyl) Phthalate	<0.01	<0.01	0.01
4-Bromophenyl Phenyl Ether	<0.01	<0.01	0.01
Butyl benzyl phthalate	<0.01	<0.01	0.01
2-Chloronaphthalene	<0.01	<0.01	0.01
4-Chlorophenyl Phenyl Ether	<0.01	<0.01	0.01
Chrysene	<0.01	<0.01	0.01
Di-n-butyl Phthalate	<0.01	<0.01	0.01
Di-n-octly Phthalate	<0.01	<0.01	0.01
Dibenz(a,h)anthracene	<0.01	<0.01	0.01
1,2-Dichlorobenzene	<0.01	<0.01	0.01
1,3-Dichlorobenzene	<0.01	<0.01	0.01
1,4-Dichlorobenzene	<0.01	<0.01	0.01
3,3-Dichlorobenzidine	<0.01	<0.01	0.01
Diethyl phthalate	<0.01	<0.01	0.01
Dimethyl phthalate	<0.01	<0.01	0.01
2,4-Dinitrotoluene	<0.01	<0.01	0.01
2,6-Dinitrotoluene	<0.01	<0.01	0.01
1,2-Diphenylhydrazine	<0.01	<0.01	0.01
Fluoranthene	<0.01	<0.01	0.01
Fluorene	<0.01	<0.01	0.01
Hexachlorobenzene	<0.01	<0.01	0.01
Hexachlorobutadiene	<0.01	<0.01	0.01
Hexachlorocyclopentadiene	<0.01	<0.01	0.01
Hexachloroethane	<0.01	<0.01	0.01
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	0.01
Isophorone	<0.01	<0.01	0.01
Naphthalene	<0.01	<0.01	0.01
Nitrobenzene	<0.01	<0.01	0.01
N-Nitrosodi-n-propylamine	<0.01	<0.01	0.01
N-Nitrosodimethylamine	<0.01	<0.01	0.01
N-Nitrosodiphenylamine	<0.01	<0.01	0.01
Phenanthrene	<0.01	<0.01	0.01
Pyrene	<0.01	<0.01	0.01
1,2,4-Trichlorobenzene	<0.01	<0.01	0.01

Attachment A (ug/L)

	Pollutant	Result	QL
Metals	Antimony, dissolved	<QL	5
	Arsenic, dissolved	<QL	5
	Cadmium, dissolved	<QL	0.5
	Chromium III, dissolved [8]	<QL	3
	Chromium VI, dissolved [8]	<QL	3
	Copper, dissolved	<QL	2
	Lead, dissolved	<QL	5
	Mercury, dissolved	<QL	0.003
	Nickel, dissolved	<QL	5
	Selenium, Total Recoverable	<QL	5
	Silver, dissolved	<QL	1
	Thallium, dissolved	<QL	5
	Zinc, dissolved	<QL	5
Pesticides/ PCBs	Aldrin	<QL	0.05
	Chlordane	<QL	0.2
	Chlorpyrifos	<QL	0.2
	DDD	<QL	0.1
	DDE	<QL	0.1
	DDT	<QL	0.1
	Demeton	<QL	1
	Diazinon	<QL	1
	Dieldrin	<QL	0.1
	Alpha-Endosulfan	<QL	0.1
	Beta-Endosulfan	<QL	0.1
	Endosulfan Sulfate	<QL	0.1
	Endrin	<QL	0.1
	Endrin Aldehyde	<QL	0.05
	Guthion	<QL	1
	Heptachlor	<QL	0.05
	Heptachlor Epoxide	<QL	0.05
	Hexachlorocyclohexane Alpha-BHC	<QL	0.05
	Hexachlorocyclohexane Beta-BHC	<QL	0.05
	Hexachlorocyclohexane Gamma-BHC or Lindane	<QL	0.05
	Kepone	<QL	5
	Malathion	<QL	1
	Methoxychlor	<QL	0.05
	Mirex	<QL	0.05
	Parathion	<QL	1
	PCB Total	<QL	7
	Toxaphene	<QL	5
Base-Neutral Compounds	Acenaphthene	<QL	10
	Anthracene	<QL	10
	Benzidine	<QL	5
	Benzo (a) anthracene	<QL	10
	Benzo (b) fluoranthene	<QL	10
	Benzo (k) fluoranthene	<QL	10
	Benzo (a) pyrene	<QL	10
	Bis 2-Chloroethyl Ether	<QL	5
	Bis 2-Chloroisopropyl Ether	<QL	5
	Butyl benzyl phthalate	<QL	10
	2-Chloronaphthalene	<QL	5
	Chrysene	<QL	10
	Dibenz(a,h)anthracene	<QL	20
	Dibutyl phthalate (Di-n-Butyl Phthalate)	<QL	10
	1,2-Dichlorobenzene	<QL	10
	1,3-Dichlorobenzene	<QL	10
	1,4-Dichlorobenzene	<QL	5
	3,3-Dichlorobenzidine	<QL	10
	Diethyl phthalate	<QL	10
	Bis-2-ethylhexyl phthalate	<QL	5
	Dimethyl phthalate	<QL	10
	2,4-Dinitrotoluene	<QL	5

Attachment A (ug/L)

	Pollutant	Result	QL
	1,2-Diphenylhydrazine	<QL	10
	Fluoranthene	<QL	10
	Fluorene	<QL	5
	Hexachlorobenzene	<QL	5
	Hexachlorobutadiene	<QL	5
	Hexachlorocyclopentadiene	<QL	5
	Hexachloroethane	<QL	5
	Indeno(1,2,3-cd) pyrene	<QL	20
	Isophorone	<QL	10
	Nitrobenzene	<QL	10
	N-Nitrosodimethylamine	<QL	5
	N-Nitrosodi-n-propylamine	<QL	5
	N-Nitrosodiphenylamine	<QL	5
	Pyrene	<QL	10
	1,2,4-Trichlorobenzene	<QL	10
Volatiles	Acrolein	<QL	50
	Acrylonitrile	<QL	10
	Benzene	<QL	10
	Bromoform	<QL	10
	Carbon Tetrachloride	<QL	10
	Chlorobenzene	<QL	50
	Chlorodibromomethane	<QL	10
	Chloroform	<QL	10
	Dichloromethane	<QL	20
	Dichlorobromomethane	<QL	10
	1,2-Dichloroethane	<QL	10
	1,1-Dichloroethylene	<QL	10
	1,2-trans-dichloroethylene	<QL	5
	1,2-Dichloropropane	<QL	5
	1,3-Dichloropropene	<QL	5
	Ethylbenzene	<QL	10
	Methyl Bromide	<QL	10
	1,1,2,2-Tetrachloroethane	<QL	5
	Tetrachloroethylene	<QL	10
	Toluene	<QL	10
	1,1,2-Trichloroethane	<QL	5
	Trichloroethylene	<QL	10
	Vinyl Chloride	<QL	10
Radionuclides	Uranium (pCi/L)	<QL	0.8
	Combined Radium 226 and 228 (pCi/L)	<QL	1
	Beta Particle & Photon Activity(pCi/L)	<QL	2
	Gross Alpha Particle Activity (pCi/L)	<QL	1.9
Acid Extractable	2-Chlorophenol	<QL	10
	2,4 Dichlorophenol	<QL	10
	2,4 Dimethylphenol	<QL	10
	2,4-Dinitrophenol	<QL	20
	2-Methyl-4,6-Dinitrophenol	<QL	5
	Nonylphenol	<QL	5
	Pentachlorophenol	<QL	50
	Phenol	<QL	10
	2,4,6-Trichlorophenol	<QL	10
Miscellaneous	Ammonia as NH3-N	2750	200
	Chlorides	48000	1000
	Chlorine, Total Residual	<QL	100
	Free Cyanide	<QL	10
	E. coli / Enterococcus (MPN)	<QL	1
	Hydrogen Sulfide	492	100
	Tributyltin	<QL	40
	Hardenss	91000	1000

Attachment 8 – 1989 Richmond Crater Water Quality Management Plan

Richmond Crater Interim Water Quality Management Plan Wasteload Allocations

TABLE B7- WASTE LOAD ALLOCATION FOR THE YEAR 2000

	SUMMER (June-October)						WINTER (November-May)				
	FLOW (mgd)	CBOD5		NH3-N1,3		DO2 (mg/l)	CBOD5		NH3-N1		DO2 (mg/l)
		(lbs/d)	(mg/l)	(lbs/d)	(mg/l)		(lbs/d)	(mg/l)	(lbs/d)	(mg/l)	
City of Richmond STP	45.08	3002	8.0	2403	6.4	5.6	5367	14.3		15.2	5.6
E.I. DuPont-Spruance	196.99	948		590		4.4	948		756		2.9
Falling Creek STP	10.10	1348	16.0	539	6.4	5.9	2023	24.0	1281	15.2	5.9
Proctor's Creek STP	16.80	1602	11.4	961	6.9	5.9	2403	17.1	1402	10.0	5.9
Reynolds Metals Co.	0.78	172		13		6.5	172		13		6.5
Henrico STP	32.80	3002	11.0	2403	8.8	5.6	4756	17.4	3504	12.8	5.6
American Tobacco Co.	3.00	715		113		5.8	715		113		5.8
ICI Americas, Inc.	0.20	167		8		5.8	167		8		3.1
Phillip Morris- Park 500	2.90	819		92		4.6	819		92		4.6
Allied (Chesterfield)	56.00	1255		442		5.7	1255		442		5.7
Allied (Hopewell)	170.00	2750		10326		6.1	2750		10326		6.1
Hopewell Regional WTF	36.78	12502	40.7	12091	33.5	4.8	12502	40.7	10291	33.5	4.8
Petersburg STP	15.00	2802	22.4	801	6.4	5.0	2802	22.4	2028	16.2	5.0
TOTAL	406.43	31084		28982			36679		35963		

1 NH3-N values represent ammonia as nitrogen.

2 Dissolved oxygen limits represent average minimum allowable levels.

3 Allied (Hopewell) allocation may be redistributed to the Hopewell Regional WTF by VPDES permit.

TABLE B7- WASTE LOAD ALLOCATIONS FOR THE YEAR 2010

	SUMMER (June-October)						WINTER (November-May)				
	FLOW (mgd)	CBOD5		NH3-N1,3		DO2 (mg/l)	CBOD5		NH3-N1		DO2 (mg/l)
		(lbs/d)	(mg/l)	(lbs/d)	(mg/l)		(lbs/d)	(mg/l)	(lbs/d)	(mg/l)	
City of Richmond STP	45.86	3002	7.8	2403	6.3	5.6	5367	14.0		14.9	5.6
E.I. DuPont-Spruance	16.99	948		590		4.4	948		756		2.9
Falling Creek STP	10.10	1348	16.0	539	6.4	5.9	2023	24.0	1281	15.2	5.9
Proctor's Creek STP	24.00	1602	8.0	961	4.8	5.9	2403	12.0	1402	7.0	5.9
Reynolds Metals Co.	0.78	172		13		6.5	172		13		6.5
Henrico STP	38.07	3002	9.5	2403	7.6	5.6	4756	15.0	3504	11.0	5.6
American Tobacco Co.	3.00	715		113		5.8	715		113		5.8
ICI Americas, Inc.	0.20	167		8		5.8	167		8		3.1
Phillip Morris- Park 500	2.90	819		92		4.6	819		92		4.6
Allied (Chesterfield)	56.00	1255		442		5.7	1255		442		5.7
Allied (Hopewell)	180.00	2750		10326		6.1	2750		10326		6.1
Hopewell Regional WTF	39.61	12502	37.8	10291	31.1	4.8	12502	37.8	10291	31.1	4.8
Petersburg STP	15.00	2802	22.4	801	6.4	5.0	2802	22.4	2028	16.2	5.0
TOTAL	432.1	31084		28982			36679		35963		

1 NH3-N values represent ammonia as nitrogen.

2 Dissolved oxygen limits represent average minimum allowable levels.

3 Allied (Hopewell) allocation may be redistributed to the Hopewell Regional WTF by VPDES permit.

Attachment 9 – Cormix Model

COMMONWEALTH OF VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Division of Permit Coordination

629 East Main Street Richmond, Virginia 23219

M E M O R A N D U M

Subject: Henrico Mixing

To: Kyle Winter

From: M. Dale Phillips

Date: June 22, 1999

Copies:

I have completed CROMIX1 runs for the Henrico discharge. Due to the similarity of the situations, I only made two runs; one at 60 MGD and one at 75 MGD. As you will see the predictions are for more rapid initial mixing as the flows rise. This is probably due to the increased velocity of the discharge jet as the flow is increased and the discharge port is maintained at the same size. The results are:

60 MGD, dilution is about ~~3:1~~ (KW) 2:1
75 MGD, dilution is about ~~3.5:1~~ (KW) 2.5:1

The differences in these dilutions are not significant considering the probably accuracy of the model. I would suggest that you utilize ~~3:1~~ (KW) for all flows from 60 to 75 MGD for calculating the acute WLA. For the chronic WLA the far field results indicate that you can use a dilution of about ~~8:1~~ (KW) 7:1

2:1 ✓

(EX) 3:1
total parts : effluent part
vs
2:1
stream parts : eff. part

PER PHONECONS/E-MAIL W/ DALE PHILLIPS, CORMIX DILUTIONS COUNTED EFFLUENT IN POST-EFFLUENT MIX. THIS NECESSITATED THE CHANGES IN THE DILUTIONS ABOVE.

KW 8/17/99

```
CORMIX1 PREDICTION FILE:
1111111111111111111111111111111111111111111111111111111111111111111111111111111111
                    CORNELL MIXING ZONE EXPERT SYSTEM
Subsystem CORMIX1:                                          Subsystem version:
 Submerged Single Port Discharges          CORMIX_v.3.20_____September_1996
------------------------------------------------------------------------------
------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          henrico
 Design case:              .60^mgd
 FILE NAME:                cormix\sim\HEN60   .cx1
 Time of Fortran run:      06/22/99--07:34:10

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =    210.00  AS    =   1575.00  QA    =     28.00  ICHREG= 1
 HA    =      7.50  HD    =      7.50
 UA    =      .018  F     =      .100 USTAR = .1990E-02
 UW    =     1.000 UWSTAR= .1071E-02
 Uniform density environment
 STRCND=  U         RHOAM =  997.8837

DISCHARGE PARAMETERS (metric units)
 BANK  =  LEFT      DISTB =     16.80
 D0    =     1.830 A0    =     2.630 H0    =       .92
 THETA =      .00  SIGMA =    270.00
 U0    =      .989 Q0    =     2.600       = .2600E+01
 RHO0  =  997.5393 DRHO0 = .3444E+00 GP0   = .3385E-02
 C0    = .1000E+04 CUNITS=  ppm
 IPOLL =  1        KS    = .0000E+00 KD    = .0000E+00

FLUX VARIABLES (metric units)
 Q0    = .2600E+01 M0    = .2570E+01 J0    = .8801E-02 SIGNJ0=      1.0
 Associated length scales (meters)
 LQ    =     1.62  LM    =    21.64  Lm    =    90.18  Lb    =  1565.87
                                     Lmp   = 99999.00  Lbp   = 99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    12.56  R     =    55.60

FLOW CLASSIFICATION
 11111111111111111111111111111111111111111
 1  Flow class (CORMIX1)      =    H4-90A41
 1  Applicable layer depth HS =     7.50  1
 11111111111111111111111111111111111111111

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    = .1000E+04  CUNITS=  ppm
 NTOX  =  0
 NSTD  =  0
 REGMZ =  0
 XINT  =   3000.00  XMAX  =   3000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and below the center of the port:
        16.80 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 25 display intervals per module
------------------------------------------------------------------------------
------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE

 COANDA ATTACHMENT immediately following the discharge.

       X         Y         Z         S         C         B
```

```
      .00       .00       .00       .0   .100E+04    1.29

 END OF MOD101: DISCHARGE MODULE
 ------------------------------------------------------------------------------
 ------------------------------------------------------------------------------
 BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

  Jet/plume transition motion in weak crossflow.
  Bottom-attached jet motion.

  Profile definitions:
    B = Gaussian 1/e (37%) half-width, normal to trajectory
              Half wall jet, attached to bottom.
    S = hydrodynamic centerline dilution
    C = centerline concentration (includes reaction effects, if any)

        X         Y         Z         S         C         B
      .00       .00       .00       1.0   .100E+04     .92
      .00     -1.27       .00       1.0   .100E+04    1.06
      .01     -2.55       .00       1.0   .100E+04    1.20
      .02     -3.82       .00       1.0   .100E+04    1.34
      .03     -5.17       .00       1.0   .100E+04    1.49
      .05     -6.45       .00       1.1   .949E+03    1.63
      .07     -7.72       .00       1.1   .874E+03    1.77
      .09     -9.07       .00       1.2   .806E+03    1.92
      .12    -10.35       .00       1.3   .751E+03    2.06
      .16    -11.62       .00       1.4   .703E+03    2.20
      .20    -12.97       .00       1.5   .659E+03    2.35
      .24    -14.25       .00       1.6   .621E+03    2.49
      .28    -15.52       .00       1.7   .588E+03    2.63
      .33    -16.87       .00       1.8   .556E+03    2.78
      .39    -18.14       .00       1.9   .529E+03    2.93
      .44    -19.42       .00       2.0   .505E+03    3.07
      .51    -20.77       .00       2.1   .481E+03    3.22
      .57    -22.04       .00       2.2   .461E+03    3.36
      .64    -23.31       .00       2.3   .442E+03    3.50
      .72    -24.59       .00       2.4   .425E+03    3.64
      .80    -25.93       .00       2.5   .408E+03    3.79
      .88    -27.21       .00       2.5   .393E+03    3.94
      .97    -28.48       .00       2.6   .379E+03    4.08
     1.07    -29.82       .00       2.7   .366E+03    4.23
     1.16    -31.10       .00       2.8   .354E+03    4.37
     1.26    -32.37       .00       2.9   .342E+03    4.51
  Cumulative travel time =          49. sec

 END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
 ------------------------------------------------------------------------------
 ------------------------------------------------------------------------------
 BEGIN MOD152: LIFT OFF/FALL DOWN

  Profile definitions:
    B = Gaussian 1/e (37%) half-width, normal to trajectory
    S = hydrodynamic centerline dilution
    C = centerline concentration (includes reaction effects, if any)

   Inflow (attached) and outflow (free) conditions:
        X         Y         Z         S         C         B
     1.26    -32.37       .00       2.9   .342E+03    4.51
     1.99    -41.36       .00       2.9   .342E+03    3.19
  Cumulative travel time =          89. sec

 END OF MOD152: LIFT OFF/FALL DOWN
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 BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
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Jet/plume transition motion in weak crossflow.
Plume-like motion after lift off/fall down.

The WIDTH PREDICTION B in the first entry below may exhibit some mismatch
(up to a factor of 1.5) relative to the last entry of the previous module.
This is unavoidable due to differences in the width definitions.
The actual physical transition will be smoothed out.

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	B
1.99	-41.36	.00	2.9	.342E+03	2.55
2.02	-41.82	.00	2.9	.342E+03	2.60
2.07	-42.40	.02	2.9	.342E+03	2.67
2.11	-42.85	.05	2.9	.342E+03	2.72
2.16	-43.37	.08	2.9	.342E+03	2.78
2.21	-43.95	.14	2.9	.342E+03	2.84
2.26	-44.46	.20	2.9	.342E+03	2.90
2.31	-44.97	.28	2.9	.342E+03	2.96
2.37	-45.48	.37	2.9	.342E+03	3.01
2.42	-45.99	.47	2.9	.342E+03	3.07
2.47	-46.43	.56	2.9	.342E+03	3.12
2.52	-46.93	.68	2.9	.342E+03	3.18
2.58	-47.43	.82	2.9	.342E+03	3.23
2.64	-47.93	.96	2.9	.342E+03	3.29
2.70	-48.42	1.12	2.9	.342E+03	3.34
2.76	-48.91	1.29	2.9	.342E+03	3.39
2.82	-49.39	1.47	2.9	.342E+03	3.44
2.88	-49.87	1.67	2.9	.342E+03	3.50
2.95	-50.34	1.87	2.9	.342E+03	3.55
3.02	-50.87	2.11	2.9	.342E+03	3.60
3.08	-51.33	2.34	2.9	.342E+03	3.65
3.15	-51.79	2.58	2.9	.342E+03	3.70
3.22	-52.24	2.82	2.9	.342E+03	3.75
3.29	-52.69	3.08	2.9	.342E+03	3.79
3.35	-53.13	3.35	2.9	.342E+03	3.84
3.42	-53.56	3.62	2.9	.342E+03	3.88

Cumulative travel time = 133. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD132: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 32.56 deg
Horizontal angle of layer/boundary impingement = 279.16 deg

UPSTREAM INTRUSION PROPERTIES:

Upstream intrusion length	=	424.19 m
X-position of upstream stagnation point	=	-420.77 m
Thickness in intrusion region	=	.66 m
Half-width at downstream end	=	605.87 m
Thickness at downstream end	=	.85 m

In this case, the upstream INTRUSION IS VERY LARGE, exceeding 10 times
the local water depth.
This may be caused by a very small ambient velocity, perhaps in
combination with large discharge buoyancy.
If the ambient conditions are strongly transient (e.g. tidal), then the
CORMIX steady-state predictions of upstream intrusion are probably
unrealistic.

The plume predictions prior to boundary impingement will be acceptable, however.

Control volume inflow:

X	Y	Z	S	C	B
3.42	-53.56	3.62	2.9	.342E+03	3.88

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH	ZU	ZL
-420.77	-53.56	7.50	9999.9	.000E+00	.00	.00	7.50	7.50
-406.23	-53.56	7.50	12.6	.795E+02	.15	85.68	7.50	7.35
-334.97	-53.56	7.50	5.2	.191E+03	.37	208.12	7.50	7.13
-263.71	-53.56	7.50	3.9	.254E+03	.49	281.58	7.50	7.01
-192.45	-53.56	7.50	3.4	.296E+03	.57	339.50	7.50	6.93
-121.19	-53.56	7.50	3.1	.324E+03	.63	388.89	7.50	6.87
-49.94	-53.56	7.50	2.9	.339E+03	.65	432.67	7.50	6.85
21.32	-53.56	7.50	3.0	.336E+03	.66	472.42	7.50	6.84
92.58	-53.56	7.50	4.1	.242E+03	.72	509.07	7.50	6.78
163.84	-53.56	7.50	5.7	.175E+03	.79	543.26	7.50	6.71
235.10	-53.56	7.50	6.7	.150E+03	.84	575.41	7.50	6.66
306.36	-53.56	7.50	7.1	.141E+03	.85	605.87	7.50	6.65

Cumulative travel time = 17172. sec

END OF MOD132: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

** End of NEAR-FIELD REGION (NFR) **
Some BOUNDARY INTERACTION with both banks occurs at end of near-field.
The dilution values in one or more of the preceding zones may be too high.
Carefully evaluate results in near-field and check degree of interaction.

BEGIN MOD181: MIXED PLUME/BOUNDED CHANNEL/POSSIBLE UPSTREAM WEDGE INTRUSION

An UPSTREAM INTRUDING WEDGE is formed along the surface/pycnocline.

UPSTREAM WEDGE INTRUSION PROPERTIES in bounded channel (laterally uniform):

Wedge length	=	279.73 m
X-Position of wedge tip	=	26.62 m
Thickness at discharge (end of NFR)	=	4.16 m

(Wedge thickness gradually decreases to zero at wedge tip.)

In this case, the upstream INTRUSION IS VERY LARGE, exceeding 10 times the local water depth.
This may be caused by a very small ambient velocity, perhaps in combination with large discharge buoyancy.
If the ambient conditions are strongly transient (e.g. tidal), then the CORMIX steady-state predictions of upstream intrusion are probably unrealistic.
The plume predictions prior to boundary impingement and wedge formation will be acceptable, however.

X	Y	Z	S	C	BV	BH	ZU	ZL
306.36	16.80	7.50	7.1	.141E+03	7.50	210.00	7.50	.00

Cumulative travel time = 17172. sec

VERTICALLY AND LATERALLY FULLY MIXED over layer depth: END OF SIMULATION!

END OF MOD181: MIXED PLUME/BOUNDED CHANNEL/POSSIBLE UPSTREAM WEDGE INTRUSION

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CORMIX1 PREDICTION FILE:
1111111111111111111111111111111111111111111111111111111111111111111111111111111111
                    CORNELL MIXING ZONE EXPERT SYSTEM
Subsystem CORMIX1:                                          Subsystem version:
 Submerged Single Port Discharges              CORMIX_v.3.20_____September_1996
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          henrico
 Design case:              hen75
 FILE NAME:                cormix\sim\hen75    .cx1
 Time of Fortran run:      06/22/99--07:40:05

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =    210.00  AS    =   1575.00  QA    =     28.00  ICHREG= 1
 HA    =      7.50  HD    =      7.50
 UA    =      .018  F     =      .100 USTAR = .1990E-02
 UW    =     1.000 UWSTAR= .1071E-02
 Uniform density environment
 STRCND=  U          RHOAM =  997.8837

DISCHARGE PARAMETERS (metric units)
 BANK  =  LEFT      DISTB =     16.80
 D0    =     1.830 A0    =     2.630 H0    =       .92
 THETA =      .00  SIGMA =    270.00
 U0    =     1.255 Q0    =     3.300       = .3300E+01
 RHO0  =  997.5393  DRHO0 = .3444E+00  GP0   = .3385E-02
 C0    = .1000E+04  CUNITS=  ppm
 IPOLL =  1         KS    = .0000E+00  KD    = .0000E+00

FLUX VARIABLES (metric units)
 Q0    = .3300E+01  M0    = .4141E+01  J0    = .1117E-01  SIGNJ0=      1.0
 Associated length scales (meters)
 LQ    =     1.62  LM    =     27.47  Lm    =    114.46  Lb    =  1987.45
                                      Lmp   =  99999.00  Lbp   = 99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    15.94  R     =    70.57

FLOW CLASSIFICATION
 1111111111111111111111111111111111111111
 1  Flow class (CORMIX1)      =    H4-90A41
 1  Applicable layer depth HS =     7.50  1
 1111111111111111111111111111111111111111

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    = .1000E+04  CUNITS=  ppm
 NTOX  =  0
 NSTD  =  0
 REGMZ =  0
 XINT  =   3000.00  XMAX  =   3000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and below the center of the port:
        16.80 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 25 display intervals per module
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE

 COANDA ATTACHMENT immediately following the discharge.

       X         Y         Z         S         C         B
```

.00	.00	.00	.0	.100E+04	1.29

END OF MOD101: DISCHARGE MODULE

BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Jet/plume transition motion in weak crossflow.
Bottom-attached jet motion.

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
Half wall jet, attached to bottom.
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	B
.00	.00	.00	1.0	.100E+04	.92
.00	-1.57	.00	1.0	.100E+04	1.10
.01	-3.22	.00	1.0	.100E+04	1.28
.02	-4.87	.00	1.0	.100E+04	1.46
.04	-6.52	.00	1.1	.945E+03	1.64
.06	-8.17	.00	1.2	.850E+03	1.82
.09	-9.82	.00	1.3	.773E+03	2.00
.12	-11.47	.00	1.4	.709E+03	2.19
.16	-13.12	.00	1.5	.654E+03	2.37
.20	-14.77	.00	1.6	.608E+03	2.55
.24	-16.42	.00	1.8	.567E+03	2.73
.30	-18.07	.00	1.9	.532E+03	2.91
.35	-19.72	.00	2.0	.500E+03	3.10
.42	-21.37	.00	2.1	.472E+03	3.28
.48	-23.02	.00	2.2	.447E+03	3.46
.56	-24.67	.00	2.4	.425E+03	3.65
.64	-26.31	.00	2.5	.404E+03	3.83
.72	-27.96	.00	2.6	.386E+03	4.01
.81	-29.61	.00	2.7	.369E+03	4.20
.91	-31.26	.00	2.8	.353E+03	4.38
1.01	-32.90	.00	2.9	.339E+03	4.56
1.11	-34.55	.00	3.1	.326E+03	4.75
1.22	-36.20	.00	3.2	.314E+03	4.93
1.34	-37.84	.00	3.3	.302E+03	5.12
1.46	-39.49	.00	3.4	.292E+03	5.30
1.59	-41.13	.00	3.5	.282E+03	5.48

Cumulative travel time = 57. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD152: LIFT OFF/FALL DOWN

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

Inflow (attached) and outflow (free) conditions:

X	Y	Z	S	C	B
1.59	-41.13	.00	3.5	.282E+03	5.48
2.47	-52.06	.00	3.5	.282E+03	3.87

Cumulative travel time = 106. sec

END OF MOD152: LIFT OFF/FALL DOWN

BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Jet/plume transition motion in weak crossflow.
Plume-like motion after lift off/fall down.

The WIDTH PREDICTION B in the first entry below may exhibit some mismatch
(up to a factor of 1.5) relative to the last entry of the previous module.
This is unavoidable due to differences in the width definitions.
The actual physical transition will be smoothed out.

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	B
2.47	-52.06	.00	3.5	.282E+03	3.10
2.50	-52.52	.00	3.5	.282E+03	3.15
2.55	-53.06	.02	3.5	.282E+03	3.21
2.60	-53.66	.04	3.5	.282E+03	3.28
2.65	-54.19	.07	3.5	.282E+03	3.34
2.69	-54.65	.11	3.5	.282E+03	3.39
2.74	-55.19	.16	3.5	.282E+03	3.45
2.79	-55.72	.22	3.5	.282E+03	3.51
2.84	-56.24	.28	3.5	.282E+03	3.57
2.89	-56.77	.36	3.5	.282E+03	3.63
2.95	-57.36	.46	3.5	.282E+03	3.70
3.00	-57.88	.56	3.5	.282E+03	3.76
3.06	-58.41	.67	3.5	.282E+03	3.82
3.12	-58.92	.79	3.5	.282E+03	3.88
3.17	-59.44	.92	3.5	.282E+03	3.93
3.23	-59.95	1.06	3.5	.282E+03	3.99
3.29	-60.46	1.21	3.5	.282E+03	4.05
3.35	-60.97	1.37	3.5	.282E+03	4.10
3.41	-61.41	1.51	3.5	.282E+03	4.15
3.47	-61.92	1.69	3.5	.282E+03	4.21
3.53	-62.41	1.87	3.5	.282E+03	4.26
3.60	-62.91	2.07	3.5	.282E+03	4.32
3.66	-63.40	2.28	3.5	.282E+03	4.37
3.73	-63.88	2.49	3.5	.282E+03	4.42
3.80	-64.37	2.71	3.5	.282E+03	4.47
3.86	-64.84	2.94	3.5	.282E+03	4.53

Cumulative travel time = 148. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD132: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 26.11 deg
Horizontal angle of layer/boundary impingement = 278.13 deg

UPSTREAM INTRUSION PROPERTIES:

Upstream intrusion length	=	755.23 m
X-position of upstream stagnation point	=	-751.36 m
Thickness in intrusion region	=	.92 m
Half-width at downstream end	=	938.82 m
Thickness at downstream end	=	.98 m

In this case, the upstream INTRUSION IS VERY LARGE, exceeding 10 times
the local water depth.
This may be caused by a very small ambient velocity, perhaps in
combination with large discharge buoyancy.
If the ambient conditions are strongly transient (e.g. tidal), then the
CORMIX steady-state predictions of upstream intrusion are probably
unrealistic.

The plume predictions prior to boundary impingement will be acceptable, however.

Control volume inflow:

X	Y	Z	S	C	B
3.86	-64.84	2.94	3.5	.282E+03	4.53

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH	ZU	ZL
-751.36	-64.84	7.50	9999.9	.000E+00	.00	.00	7.50	7.50
-726.87	-64.84	7.50	15.7	.637E+02	.21	132.77	7.50	7.29
-606.86	-64.84	7.50	6.5	.154E+03	.50	322.49	7.50	7.00
-486.84	-64.84	7.50	4.9	.204E+03	.67	436.32	7.50	6.83
-366.83	-64.84	7.50	4.2	.239E+03	.78	526.07	7.50	6.72
-246.81	-64.84	7.50	3.8	.263E+03	.86	602.60	7.50	6.64
-126.80	-64.84	7.50	3.6	.277E+03	.91	670.45	7.50	6.59
-6.78	-64.84	7.50	3.5	.282E+03	.92	732.04	7.50	6.58
113.23	-64.84	7.50	4.8	.209E+03	.93	788.83	7.50	6.57
233.24	-64.84	7.50	7.4	.134E+03	.96	841.80	7.50	6.54
353.26	-64.84	7.50	9.2	.109E+03	.97	891.63	7.50	6.53
473.27	-64.84	7.50	9.9	.101E+03	.98	938.82	7.50	6.52

Cumulative travel time = 26552. sec

END OF MOD132: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

** End of NEAR-FIELD REGION (NFR) **

The LIMITING DILUTION (given by ambient flow/discharge ratio) is: 9.5
This value is below the computed dilution of 9.9 at the end of the NFR.
Mixing for this discharge configuration is constrained by LOW AMBIENT FLOW!

The previous module predictions are unreliable since the limiting dilution cannot be exceeded for this shallow water discharge configuration.

A subsequent module (MOD181) will predict the properties of the cross-sectionally fully mixed plume with limiting dilution and will compute a POSSIBLE UPSTREAM WEDGE INTRUSION.

BEGIN MOD181: MIXED PLUME/BOUNDED CHANNEL/POSSIBLE UPSTREAM WEDGE INTRUSION

The DOWNSTREAM flow field for this unstable shallow water discharge is VERTICALLY FULLY MIXED.
The mixing is controlled by the limiting dilution = 9.5

Channel DENSIMETRIC FROUDE NUMBER (FCHAN) for this mixed flow = .34

An UPSTREAM INTRUDING WEDGE is formed along the surface/pycnocline.

UPSTREAM WEDGE INTRUSION PROPERTIES in bounded channel (laterally uniform):
Wedge length = 183.08 m
X-Position of wedge tip = 290.19 m
Thickness at discharge (end of NFR) = 3.82 m
(Wedge thickness gradually decreases to zero at wedge tip.)

In this case, the upstream INTRUSION IS VERY LARGE, exceeding 10 times the local water depth.
This may be caused by a very small ambient velocity, perhaps in combination

with large discharge buoyancy.
If the ambient conditions are strongly transient (e.g. tidal), then the CORMIX steady-state predictions of upstream intrusion are probably unrealistic.
The plume predictions prior to boundary impingement and wedge formation will be acceptable, however.

X	Y	Z	S	C	BV	BH	ZU	ZL
473.27	16.80	7.50	9.5	.105E+03	7.50	210.00	7.50	.00

Cumulative travel time = 26552. sec

VERTICALLY AND LATERALLY FULLY MIXED over layer depth: END OF SIMULATION!

END OF MOD181: MIXED PLUME/BOUNDED CHANNEL/POSSIBLE UPSTREAM WEDGE INTRUSION

CORMIX1: Submerged Single Port Discharges End of Prediction File

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Attachment 10 – Effluent Limitation Development

VA0063690 – Henrico County Water Reclamation Facility

MSTRANTI DATA SOURCE REPORT FOR OUTFALL 001

Stream Information:	**Basis**
Mean Hardness	Ambient Data for Station 2-JMS099.30
90th% Temperature (Annual)	Ambient Data for Station 2-JMS094.96
90th% Temperature (Winter)	No Tiered Limitations, Not Applicable
90th% Maximum pH	Ambient Data for Station 2-JMS094.96
10th% Maximum pH	Ambient Data for Station 2-JMS094.96
Tier Designation	Flow Frequency Memorandum
Stream Flows:	
1QQ10 (Acute WLA Multiplier)	June 22, 1999 CORMIX Model Memorandum
7Q10 (Chronic WLA Multiplier)	
30Q10 (Chronic WLA Multiplier for Ammonia)	
Mixing Information:	
1Q10 Mix	100% Based on CORMIX Model
7Q10 Mix	
30Q10 Mix	
Effluent Information:	
Mean Hardness	Attachment A Monitoring
90th% Temperature (Annual)	Best Professional Judgment – Conservative Value
90th% Temperature (Winter)	No Tiered Limitations, Not Applicable
90th% Maximum pH	DMR Effluent Data
10th% Maximum pH	
Discharge Flow	EPA Form 2A

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Henrico WRF Permit No.: VA0063690

Receiving Stream: James River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		
Mean Hardness (as CaCO3) =	66	mg/L
90% Temperature (Annual) =	33.2	deg C
90% Temperature (Wet season) =		deg C
90% Maximum pH =	8	SU
10% Maximum pH =	7.1	SU
Tier Designation (1 or 2) =	1	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows		
1Q10 (Annual) =	2	MGD
7Q10 (Annual) =	7	MGD
30Q10 (Annual) =	7	MGD
1Q10 (Wet season) =	7	MGD
30Q10 (Wet season)	7	MGD
30Q5 =	7	MGD
Harmonic Mean =	7	MGD

Mixing Information		
Annual - 1Q10 Mix =	100	%
- 7Q10 Mix =	100	%
- 30Q10 Mix =	100	%
Wet Season - 1Q10 Mix =	100	%
- 30Q10 Mix =	100	%

Effluent Information		
Mean Hardness (as CaCO3) =	83.9	mg/L
90% Temp (Annual) =	28	deg C
90% Temp (Wet season) =		deg C
90% Maximum pH =	7.4	SU
10% Maximum pH =	6.6	SU
Discharge Flow =	1	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	5	--	--	na	9.9E+02	--	--	na	7.9E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.9E+03**
Acrolein	0	--	--	na	9.3E+00	--	--	na	7.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.4E+01**
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	2.0E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+01**
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	9.0E+00	--	na	4.0E-03	--	--	--	--	--	--	--	--	**9.0E+00**	**--**	**na**	**4.0E-03**
Ammonia-N (mg/l) (Yearly)	0	1.44E+01	9.19E-01	na	--	4.3E+01	7.4E+00	na	--	--	--	--	--	--	--	--	--	**4.3E+01**	**7.4E+00**	**na**	**--**
Ammonia-N (mg/l) (High Flow)	0	1.09E+01	2.94E+00	na	--	8.7E+01	2.4E+01	na	--	--	--	--	--	--	--	--	--	**8.7E+01**	**2.4E+01**	**na**	**--**
Anthracene	0	--	--	na	4.0E+04	--	--	na	3.2E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.2E+05**
Antimony	0	--	--	na	6.4E+02	--	--	na	5.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.1E+03**
Arsenic	o	3.4E+02	1.5E+02	na	--	1.0E+03	1.2E+03	na	--	--	--	--	--	--	--	--	--	**1.0E+03**	**1.2E+03**	**na**	**--**
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	4.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.1E+03**
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	1.6E-02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.6E-02**
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	1.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+00**
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	1.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+00**
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	1.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+00**
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	1.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+00**
Bis2-Chloroethyl Ether [C]	0	--	--	na	5.3E+00	--	--	na	4.2E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.2E+01**
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	5.2E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.2E+05**
Bis 2-Ethylhexyl Phthalate [C]	0	--	--	na	2.2E+01	--	--	na	1.8E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E+02**
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	1.1E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+04**
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	1.5E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+04**
Cadmium	0	2.7E+00	8.4E-01	na	--	8.1E+00	6.7E+00	na	--	--	--	--	--	--	--	--	--	**8.1E+00**	**6.7E+00**	**na**	**--**
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	1.3E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.3E+02**
Chlordane [C]	0	2.4E+00	4.3E-03	na	8.1E-03	7.2E+00	3.4E-02	na	6.5E-02	--	--	--	--	--	--	--	--	**7.2E+00**	**3.4E-02**	**na**	**6.5E-02**
Chloride	0	8.6E+05	2.3E+05	na	--	2.6E+06	1.8E+06	na	--	--	--	--	--	--	--	--	--	**2.6E+06**	**1.8E+06**	**na**	**--**
TRC	0	1.9E+01	1.1E+01	na	--	5.7E+01	8.8E+01	na	--	--	--	--	--	--	--	--	--	**5.7E+01**	**8.8E+01**	**na**	**--**
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	1.3E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.3E+04**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	1.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.0E+03**
Chloroform	0	--	--	na	1.1E+04	--	--	na	8.8E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.8E+04**
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	1.3E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.3E+04**
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	1.2E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.2E+03**
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	2.5E-01	3.3E-01	na	--	--	--	--	--	--	--	--	--	**2.5E-01**	**3.3E-01**	**na**	**--**
Chromium III	0	4.4E+02	5.4E+01	na	--	1.3E+03	4.3E+02	na	--	--	--	--	--	--	--	--	--	**1.3E+03**	**4.3E+02**	**na**	**--**
Chromium VI	0	1.6E+01	1.1E+01	na	--	4.8E+01	8.8E+01	na	--	--	--	--	--	--	--	--	--	**4.8E+01**	**8.8E+01**	**na**	**--**
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Chrysene [C]	0	--	--	na	1.8E-02	--	--	na	1.4E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E-01**
Copper	0	9.9E+00	6.5E+00	na	--	3.0E+01	5.2E+01	na	--	--	--	--	--	--	--	--	--	**3.0E+01**	**5.2E+01**	**na**	**--**
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	6.6E+01	4.2E+01	na	1.3E+05	--	--	--	--	--	--	--	--	**6.6E+01**	**4.2E+01**	**na**	**1.3E+05**
DDD [C]	0	--	--	na	3.1E-03	--	--	na	2.5E-02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.5E-02**
DDE [C]	0	--	--	na	2.2E-03	--	--	na	1.8E-02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E-02**
DDT [C]	0	1.1E+00	1.0E-03	na	2.2E-03	3.3E+00	8.0E-03	na	1.8E-02	--	--	--	--	--	--	--	--	**3.3E+00**	**8.0E-03**	**na**	**1.8E-02**
Demeton	0	--	1.0E-01	na	--	--	8.0E-01	na	--	--	--	--	--	--	--	--	--	**--**	**8.0E-01**	**na**	**--**
Diazinon	0	1.7E-01	1.7E-01	na	--	5.1E-01	1.4E+00	na	--	--	--	--	--	--	--	--	--	**5.1E-01**	**1.4E+00**	**na**	**--**
Dibenz(a,h)anthracene [C]	0	--	--	na	1.8E-01	--	--	na	1.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+00**
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	1.0E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.0E+04**
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	7.7E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.7E+03**
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	1.5E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+03**
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	2.2E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.2E+00**
Dichlorobromomethane [C]	0	--	--	na	1.7E+02	--	--	na	1.4E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+03**
1,2-Dichloroethane [C]	0	--	--	na	3.7E+02	--	--	na	3.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.0E+03**
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	5.7E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.7E+04**
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	8.0E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.0E+04**
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	2.3E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.3E+03**
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	1.2E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.2E+03**
1,3-Dichloropropene [C]	0	--	--	na	2.1E+02	--	--	na	1.7E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+03**
Dieldrin [C]	0	2.4E-01	5.6E-02	na	5.4E-04	7.2E-01	4.5E-01	na	4.3E-03	--	--	--	--	--	--	--	--	**7.2E-01**	**4.5E-01**	**na**	**4.3E-03**
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	3.5E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.5E+05**
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	6.8E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.8E+03**
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	8.8E+06	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.8E+06**
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	3.6E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.6E+04**
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	4.2E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.2E+04**
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	2.2E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.2E+03**
2,4-Dinitrotoluene [C]	0	--	--	na	3.4E+01	--	--	na	2.7E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.7E+02**
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	4.1E-07	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.1E-07**
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	1.6E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.6E+01**
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	6.6E-01	4.5E-01	na	7.1E+02	--	--	--	--	--	--	--	--	**6.6E-01**	**4.5E-01**	**na**	**7.1E+02**
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	6.6E-01	4.5E-01	na	7.1E+02	--	--	--	--	--	--	--	--	**6.6E-01**	**4.5E-01**	**na**	**7.1E+02**
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	6.6E-01	4.5E-01	--	--	--	--	--	--	--	--	--	--	**6.6E-01**	**4.5E-01**	**--**	**--**
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	7.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.1E+02**
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	2.6E-01	2.9E-01	na	4.8E-01	--	--	--	--	--	--	--	--	**2.6E-01**	**2.9E-01**	**na**	**4.8E-01**
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	2.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.4E+00**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+04**
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	1.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+03**
Fluorene	0	--	--	na	5.3E+03	--	--	na	4.2E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.2E+04**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Guthion	0	--	1.0E-02	na	--	--	8.0E-02	na	--	--	--	--	--	--	--	--	--	**--**	**8.0E-02**	**na**	**--**
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	1.6E+00	3.0E-02	na	6.3E-03	--	--	--	--	--	--	--	--	**1.6E+00**	**3.0E-02**	**na**	**6.3E-03**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	1.6E+00	3.0E-02	na	3.1E-03	--	--	--	--	--	--	--	--	**1.6E+00**	**3.0E-02**	**na**	**3.1E-03**
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	2.3E-02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.3E-02**
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	1.4E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+03**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	3.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.9E-01**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	1.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+00**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	1.8E+00	2.9E+00	--	na	1.4E+01	--	--	--	--	--	--	--	--	**2.9E+00**	**--**	**na**	**1.4E+01**
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	8.8E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.8E+03**
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	2.6E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.6E+02**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	1.6E+01	na	--	--	--	--	--	--	--	--	--	**--**	**1.6E+01**	**na**	**--**
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	1.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+00**
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	7.7E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.7E+04**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Lead	0	7.8E+01	8.3E+00	na	--	2.3E+02	6.6E+01	na	--	--	--	--	--	--	--	--	--	**2.3E+02**	**6.6E+01**	**na**	**--**
Malathion	0	--	1.0E-01	na	--	--	8.0E-01	na	--	--	--	--	--	--	--	--	--	**--**	**8.0E-01**	**na**	**--**
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Mercury	0	1.4E+00	7.7E-01	- -	- -	4.2E+00	6.2E+00	- -	- -	--	--	--	--	--	--	--	--	**4.2E+00**	**6.2E+00**	**- -**	**- -**
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	1.2E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.2E+04**
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	4.7E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.7E+04**
Methoxychlor	0	--	3.0E-02	na	--	--	2.4E-01	na	--	--	--	--	--	--	--	--	--	**--**	**2.4E-01**	**na**	**--**
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Nickel	0	1.4E+02	1.5E+01	na	4.6E+03	4.1E+02	1.2E+02	na	3.7E+04	--	--	--	--	--	--	--	--	**4.1E+02**	**1.2E+02**	**na**	**3.7E+04**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	5.5E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.5E+03**
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	2.4E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.4E+02**
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	4.8E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.8E+02**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	4.1E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.1E+01**
Nonylphenol	0	2.8E+01	6.6E+00	--	--	8.4E+01	5.3E+01	na	--	--	--	--	--	--	--	--	--	**8.4E+01**	**5.3E+01**	**na**	**--**
Parathion	0	6.5E-02	1.3E-02	na	--	2.0E-01	1.0E-01	na	--	--	--	--	--	--	--	--	--	**2.0E-01**	**1.0E-01**	**na**	**--**
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	1.1E-01	na	5.1E-03	--	--	--	--	--	--	--	--	**--**	**1.1E-01**	**na**	**5.1E-03**
Pentachlorophenol [C]	0	7.6E+00	6.7E+00	na	3.0E+01	2.3E+01	5.3E+01	na	2.4E+02	--	--	--	--	--	--	--	--	**2.3E+01**	**5.3E+01**	**na**	**2.4E+02**
Phenol	0	--	--	na	8.6E+05	--	--	na	6.9E+06	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.9E+06**
Pyrene	0	--	--	na	4.0E+03	--	--	na	3.2E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.2E+04**
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Beta and Photon Activity (mrem/yr)	0	--	--	na	4.0E+00	--	--	na	3.2E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.2E+01**
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	6.0E+01	4.0E+01	na	3.4E+04	--	--	--	--	--	--	--	--	**6.0E+01**	**4.0E+01**	**na**	**3.4E+04**
Silver	0	2.0E+00	--	na	--	5.9E+00	--	na	--	--	--	--	--	--	--	--	--	**5.9E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	3.2E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.2E+02**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	2.6E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.6E+02**
Thallium	0	--	--	na	4.7E-01	--	--	na	3.8E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.8E+00**
Toluene	0	--	--	na	6.0E+03	--	--	na	4.8E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.8E+04**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	2.2E+00	1.6E-03	na	2.2E-02	--	--	--	--	--	--	--	--	**2.2E+00**	**1.6E-03**	**na**	**2.2E-02**
Tributyltin	0	4.6E-01	7.2E-02	na	--	1.4E+00	5.8E-01	na	--	--	--	--	--	--	--	--	--	**1.4E+00**	**5.8E-01**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	5.6E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.6E+02**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	1.3E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.3E+03**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	2.4E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.4E+03**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	1.9E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.9E+02**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	1.9E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.9E+02**
Zinc	0	8.9E+01	8.5E+01	na	2.6E+04	2.7E+02	6.8E+02	na	2.1E+05	--	--	--	--	--	--	--	--	**2.7E+02**	**6.8E+02**	**na**	**2.1E+05**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	5.1E+03
Arsenic	4.1E+02
Barium	na
Cadmium	3.2E+00
Chromium III	2.6E+02
Chromium VI	1.9E+01
Copper	1.2E+01
Iron	na
Lead	4.0E+01
Manganese	na
Mercury	1.7E+00
Nickel	7.0E+01
Selenium	2.4E+01
Silver	2.4E+00
Zinc	1.1E+02

Note: do not use QL's lower than the minimum QL's provided in agency guidance

STATS.exe EVALUATION

Ammonia

Chronic averaging period = 30
WLAa = 43 mg/L
WLAc = 7.4 mg/L
Q.L. = 0.2 mg/L
# samples/mo. = 30
# samples/wk. = 7

Summary of Statistics:

observations = 1
Expected Value = 9.00 mg/L
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 14.9307586912807 mg/L
Average Weekly limit = 9.1183219350406mg/L
Average Monthly LImit = 7.4 mg/L

The data are: 9.00 mg/L

Chlorides

Chronic averaging period = 4
WLAa = 2600000 µg/L
WLAc = 1800000 µg/L
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 48000 µg/L
Variance = 8294400
C.V. = 0.6
97th percentile daily values = 116804.
97th percentile 4 day average = 79861.9
97th percentile 30 day average= 57890.5
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are: 48000 µg/L

TRC

Chronic averaging period = 4
WLAa = 57 µg/L
WLAc = 88 µg/L
Q.L. = 0.1 µg/L
# samples/mo. = 30
# samples/wk. = 7

Summary of Statistics:

observations = 1
Expected Value = 20000 µg/L
Variance = 1440000 µg/L
C.V. = 0.6
97th percentile daily values = 48668.3
97th percentile 4 day average = 33275.8
97th percentile 30 day average= 24121.0
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 57 µg/L
Average Weekly limit = 34.8103107848656 µg/L
Average Monthly LImit = 28.2504063404577 µg/L

The data are: 20000 µg/L

Hydrogen Sulfide

Chronic averaging period = 4
WLAa =
WLAc = 16 µg/L
Q.L. = 100 µg/L
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 492 µg/L
Variance = 87143.0 µg/L
C.V. = 0.6
97th percentile daily values = 1197.24
97th percentile 4 day average = 818.584
97th percentile 30 day average= 593.378
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity:

Maximum Daily Limit = 23.4011965448517 µg/L
Average Weekly limit = 23.4011965448517 µg/L
Average Monthly Limit = 23.4011965448517 µg/L

The data are: 492 µg/L

Attachment 11 – WET Testing Evaluation and Limitation Development

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office

4949-A Cox Road Glen Allen, VA 23060 804/527-5020

SUBJECT: Whole Effluent Toxicity (WET) Test Data Review
TO: Curtis J. Linderman, Water Permit Manager, PRO
FROM: Jaime Bauer, PRO
DATE: June 6, 2011
COPIES: Deborah DeBiasi, CO - WET

Facility Name:	Henrico County Water Reclamation Facility
Number:	VA0063690
Receiving Stream	James River
Facility SIC:	4952
Current Outfall Descriptions:	Outfall 001 – Discharge of treated sewage wastewaters from residential, commercial, and industrial customers
Discharge Location Description:	Tidal, Freshwater

FACILITY DESCRIPTION AND PERMIT REQUIREMENTS

Henrico County Water Reclamation Facility is a publicly owned major municipal discharger of treated wastewater located at 9101 WRVA Road in the eastern portion of Henrico County. The facility has a design capacity to discharge 75 MGD of wastewater into the tidal freshwater segment of the James River near the Interstate 295 - Enon Bridge. Wastewater is received from residences as well as commercial and industrial facilities.

Part I.E. of the expiring VPDES permit issued on December 2, 2005 contains WET testing requirements based on Guidance Memorandum Number 00-2012. Requirement included quarterly WET testing for one year as follows:

Test	Endpoint
48 Hour Static Acute Test Using *Ceriodaphnia dubia*	NOAEC = 100%
48 Hour Static Acute Test Using *Pinephales promelas*	
Chronic 3-Brood Static Renewal Survival and Reproduction Test Using *Ceriodaphnia dubia*	NOEC = 17% (equivalent to a TU_c= 5.88)
Chronic 7-Day Static Renewal Survival and Growth Test Using *Pinephales promelas*	

After one year, the WET monitoring frequency was reduced to chronic toxicity testing on both species.

DATA SUMMARY

Those results are summarized in Tables 1 and 2 below. All tests were performed in accordance with approved testing techniques. All acute and chronic toxicity test results indicate compliance with the specified endpoints. It is noted however, that the NOEC for all chronic test on both species was equal to

100% with the exception of the August 2006 test for Growth and Reproduction for *Pinephales promelas* The NOEC for that test was reported as 50% which is still greater than the NOEC endpoint of 17%.

Table 1: Acute Toxicity Test Results

Test Date		*Ceriodaphnia dubia*		*Pinephales promelas*	
		NOAEC	**TU_a**	**NOAEC**	**TU_a**
November 2005	Quarter 1	100%	<1	100%	<1
February 2006	Quarter 2	100%	<1	100%	<1
May 2006	Quarter 3	100%	<1	100%	<1
August 2006	Quarter 4	100%	<1	100%	<1

Table 2: Chronic Toxicity Test Results

Test Date		*Ceriodaphnia dubia*		*Pinephales promelas*	
		Growth and Reproduction	**Survival in 100% Effluent**	**Growth and Reproduction**	**Survival in 100% Effluent**
November 2005	Quarter 1	100%	100%	100%	100%
February 2006	Quarter 2	100%	100%	100%	100%
May 2006	Quarter 3	100%	100%	100%	100%
August 2006	Quarter 4	100%	100%	50%	100%
June 2007	Annual 1	100%	100%	100%	100%
June 2008	Annual 2	100%	100%	100%	100%
July 2009	Annual 3	100%	100%	100%	100%
July 2010	Annual 4	100%	100%	100%	100%

*All tests were conducted by James R. Reed & Associate.

DISCUSSION AND DATA EVALUATION

The toxicity data was analyzed using the agency established WETLIM_2005.xls spreadsheet and the STATS.exe statistical software to determine if there is a need to adjust the acute and chronic endpoints or establish permit limitations for toxicity.

For Outfall 001, an acute and chronic dilution ratio of 2:1 and 7:1, respectively, are applied based on the 1999 CORMIX analysis and modeling results. Note that when "Y" is entered for ''Diffuser/Model Study?'' the plant and receiving stream flow information is not used in the endpoint and limitation evaluation. The plant flow is being included for informational purposes only and was obtained from the application Form 2A. .

Based on results from the WETLIM_2005 evaluation, the acute instream waste concentration is calculated as 50% and the chronic instream concentration is 14 %. Statistical evaluation resulted in no recommended limitation on the basis of acute or chronic toxicity (See attached). A chronic endpoint of NOEC = 17% (equivalent to a TU_c= 5.88) is still appropriate.

RECOMMENDATIONS

In accordance with TMP Guidance 2000 (DEQ Guidance Memo No. 00-2012), data evaluation, and best professional judgment, it is the recommended the permittee be required to perform annual WET monitoring for chronic toxicity using Chronic 3-Brood Survival and Reproduction Static Renewal Test with *Ceriodaphnia dubia and the* Chronic 7-Day Survival and Growth Static Renewal Test with *Pimephales promelas* The recommended permit language for inclusion in the permit is attached.

Statistical Evaluation Results

Acute C dubia
Chronic averaging period = 4
WLAa = 6
WLAc = 7
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 4
Expected Value = 1
Variance = .36
C.V. = 0.6
97th percentile daily values = 2.43341
97th percentile 4 day average = 1.66379
97th percentile 30 day average= 1.20605
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:
1
1
1
1

Acute P promelas
Chronic averaging period = 4
WLAa = 6
WLAc = 7
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 4
Expected Value = 1
Variance = .36
C.V. = 0.6
97th percentile daily values = 2.43341
97th percentile 4 day average = 1.66379
97th percentile 30 day average= 1.20605
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:
1
1
1
1

Chronic P Promelas
Chronic averaging period = 4
WLAa = 6
WLAc = 7
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 8
Expected Value = 1.125
Variance = .455625
C.V. = 0.6
97th percentile daily values = 2.73759
97th percentile 4 day average = 1.87176
97th percentile 30 day average= 1.35680
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:
1
1
1
1
1
1
1
2

Chronic C dubia
Chronic averaging period = 4
WLAa = 6
WLAc = 7
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 8
Expected Value = 1
Variance = .36
C.V. = 0.6
97th percentile daily values = 2.43341
97th percentile 4 day average = 1.66379
97th percentile 30 day average= 1.20605
< Q.L. = 0
Model used = BPJ Assumptions , type 2 data

No Limit is required for this material

The data are:
1
1
1
1
1
1
1
1

Recommended Permit Language

Whole Effluent Toxicity (WET) Monitoring Program

1. Biological Monitoring
   a. In accordance with the schedule in Part I.E.2 below, the permittee shall perform annual chronic toxicity testing on Outfall 001 using 24-hour flow-proportioned composite samples for the duration of the permit. The chronic tests to use are:

      Chronic 3-Brood Survival and Reproduction Static Renewal Test with *Ceriodaphnia dubia*
      Chronic 7-Day Survival and Growth Static Renewal Test with *Pimephales promelas*

      These chronic tests shall be conducted in such a manner and at sufficient dilutions (minimum of five dilutions, derived geometrically) to determine the "No Observed Effect Concentration" (NOEC) for survival and reproduction or growth. Results which cannot be quantified (i.e., a "less than" NOEC value) are not acceptable, and a retest will have to be performed. A retest of a non-acceptable test must be performed during the same compliance period as the test it is replacing. Express the test NOEC as TUc (Chronic Toxic Units), by dividing 100/NOEC for DMR reporting. Report the LC_{50} at 48 hours and the IC_{25} with the NOEC's in the test report.

   b. The test dilutions should be able to determine compliance with the following endpoint(s):

      Chronic NOEC = 17%, equivalent to a TU_c = 5.88

   c. The permittee may provide additional samples to address data variability. These data shall be reported and may be included in the evaluation of effluent toxicity. Test procedures and reporting shall be in accordance with the WET testing methods cited in 40 CFR 136.3.

   d. The test data will be evaluated by DEQ for reasonable potential at the conclusion of the test period. The data may be evaluated sooner if requested by the permittee, or if toxicity has been noted. Should DEQ evaluation of the data indicate that a limit is needed, the permit may be modified, or, alternatively, revoked and reissued to include a WET limit and compliance schedule. Following written notification from DEQ of the need for including a WET limitation, the toxicity tests of Part I.E.1.a. may be discontinued.

   e. The permit may be modified or revoked and reissued to include pollutant specific limits in lieu of a WET limit should it be demonstrated that toxicity is due to specific parameters. The pollutant specific limits must control the toxicity of the effluent.

2. Reporting Schedule
   The permittee shall submit the toxicity test reports with the DMR for the tests specified in accordance with the following schedule:

Period	Compliance Date	Submittal Date
Annual 1	By 12/31/2011	By 01/10/2012
Annual 2	By 12/31/2012	By 01/10/2013
Annual 3	By 12/31/2013	By 01/10/2014
Annual 4	By 12/31/2014	By 01/10/2015
Annual 5	By 12/31/2015	By 01/10/2016

Spreadsheet for determination of WET test endpoints or WET limits

Excel 97
Revision Date: 01/10/05
File: WETLIM10.xls
(MIX.EXE required also)

Enter data in the cells with blue type:

Entry Date:	02/13/12
Facility Name:	Henrico WRF
VPDES Number:	VA0063690
Outfall Number:	1

Acute Endpoint/Permit Limit — **Use as LC_{50} in Special Condition, as TUa on DMR**

ACUTE 100% = NOAEC LC_{50} = NA % Use as NA TUa

ACUTE WLAa 0.6

Note: Inform the permittee that if the mean of the data exceeds this TUa: 1.0 a limit may result using WLA.EXE

Chronic Endpoint/Permit Limit — **Use as NOEC in Special Condition, as TUc on DMR**

CHRONIC	6.000000147	TU_c	NOEC =	17	% Use as	5.88	TU_c
BOTH*	6.000000147	TU_c	NOEC =	17	% Use as	5.88	TU_c
AML	6.000000147	TU_c	NOEC =	17	% Use as	5.88	TU_c

ACUTE WLAa,c 6
CHRONIC WLAc 7
* Both means acute expressed as chronic

Note: Inform the permittee that if the mean of the data exceeds this TUc: 2.46566808 a limit may result using WLA.EXE

% Flow to be used from MIX.EXE

Plant Flow:	75	MGD	
Acute 1Q10:	NA	MGD	100 %
Chronic 7Q10:	NA	MGD	100 %

Difuser /modeling study?

Enter Y/N y
Acute 2 :1
Chronic 7 :1

Are data available to calculate CV? (Y/N) N (Minimum of 10 data points, same species, needed) Go to Page 2
Are data available to calculate ACR? (Y/N) N (NOEC<LC50, do not use greater/less than data) Go to Page 3

NOTE: If the IWCa is >33%, specify the NOAEC = 100% test/endpoint for use

IWC_a	50 %	Plant flow/plant flow + 1Q10	
IWC_c	14.28571429 %	Plant flow/plant flow + 7Q10	
Dilution, acute	2	100/IWCa	
Dilution, chronic	7	100/IWCc	
WLA_a	0.6	Instream criterion (0.3 TUa) X's Dilution, acute	
WLA_c	7	Instream criterion (1.0 TUc) X's Dilution, chronic	
$WLA_{a,c}$	6	ACR X's WLA_a - converts acute WLA to chronic units	
ACR -acute/chronic ratio	10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)	
CV-Coefficient of variation	0.6	Default of 0.6 - if data are available, use tables Page 2)	
Constants eA	0.4109447	Default = 0.41	
eB	0.6010373	Default = 0.60	
eC	2.4334175	Default = 2.43	
eD	2.4334175	Default = 2.43 (1 samp)	No. of samples 1

****The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.**

$LTA_{a,c}$	2.4656682	WLAa,c X's eA						
LTA_c	4.2072611	WLAc X's eB					Rounded NOEC's	%
MDL** with $LTA_{a,c}$	6.000000147	TU_c	NOEC =	16.666666	(Protects from acute/chronic toxicity)		NOEC = 17	%
MDL** with LTA_c	10.23802279	TU_c	NOEC =	9.767511	(Protects from chronic toxicity)		NOEC = 10	%
AML with lowest LTA	6.000000147	TU_c	NOEC =	16.666666	Lowest LTA X's eD		NOEC = 17	

IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a

							Rounded LC50's	%
MDL with $LTA_{a,c}$	0.600000015	TU_a	LC50 =	166.666663	%	Use NOAEC=100%	LC50 = NA	%
MDL with LTA_c	1.023802279	TU_a	LC50 =	97.675110	%		LC50 = 98	

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.

Coefficient of Variation for effluent tests

CV = 0.6 (Default 0.6)

δ^2 = 0.3074847

δ = 0.554513029

Using the log variance to develop eA
(P. 100, step 2a of TSD)

Z = 1.881 (97% probability stat from table

A = -0.88929666

eA = 0.410944686

Using the log variance to develop eB
(P. 100, step 2b of TSD)

δ_4^2 = 0.086177696

δ_4 = 0.293560379

B = -0.50909823

eB = 0.601037335

Using the log variance to develop eC
(P. 100, step 4a of TSD)

δ^2 = 0.3074847

δ = 0.554513029

C = 0.889296658

eC = 2.433417525

Using the log variance to develop eD
(P. 100, step 4b of TSD)

n = 1 This number will most likely stay as "1", for 1 sample/month.

δ_n^2 = 0.3074847

δ_n = 0.554513029

D = 0.889296658

eD = 2.433417525

	Vertebrate IC_{25} Data or LC_{50} Data	LN of data	Invertebrate IC_{25} Data or LC_{50} Data	LN of data
	**********		**********	
1	0		0	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
St Dev	NEED DATA	NEED DATA	St Dev	NEED DATA NEED DATA
Mean	0	0	Mean	0 0
Variance	0	0.000000	Variance	0 0.000000
CV	0		CV	0

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Table 1. Result:	Vertebrate ACR	0
Table 2. Result:	Invertebrate ACR	0
	Lowest ACR	Default to 10

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Convert LC_{50}'s and NOEC's to Chronic TU's for use in WLA.EXE

Table 3. **ACR used: 10**

	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50, enter it here: NO DATA %LC_{50}

NO DATA TUa

DILUTION SERIES TO RECOMMEND

Table 4.

	Monitoring		Limit	
	% Effluent	TUc	% Effluent	TUc
Dilution series based on data mean	40.6	2.465668		
Dilution series to use for limit			17	5.8823529
Dilution factor to recommend:	0.6368435		0.4123106	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	63.7	1.57	41.2	2.43
	40.6	2.47	17.0	5.88
	25.8	3.87	7.0	14.27
	16.45	6.08	2.9	34.60
Extra dilutions if needed	10.48	9.55	1.2	83.92
	6.67	14.99	0.5	203.54

Cell: I9
Comment:
This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment:
If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment:
See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment:
Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment:
Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138
Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

Attachment 12 – VDH Letter Regarding Bacterial Monitoring Frequencies

Bauer, Jaime (DEQ)

From: Ragnauth, Bennett (VDH)
Sent: Monday, February 06, 2012 3:55 PM
To: Bauer, Jaime (DEQ)
Subject: RE: Previously Received VDH Comments

Importance: High

Jaime Bauer:

We have no objections to the proposed changes to the monitoring methodology. Thanks...

BKRagnauth

Bennett K. Ragnauth, P.E.
Engineering Field Director
Office of Drinking Water
East Central Field Office
300 Turner Road
Richmond, VIRGINIA 23225
Tel: 804-674-2880, ext. 102
Fax: 804-674-2815
mailto:bennett.ragnauth@vdh.virginia.gov

From: Bauer, Jaime (DEQ)
Sent: Thursday, February 02, 2012 1:53 PM
To: Ragnauth, Bennett (VDH)
Subject: Previously Received VDH Comments

Good afternoon, Mr. Ragnauth,

Virginia DEQ received the attached letter from VDH commenting on the VPDES discharge permit for the Henrico County Water Reclamation Facility in 1994. In response to VDH's concerns, DEQ limited fecal coliform in that permit and subsequent permit reissuances to 200 monthly and 400 weekly geometric mean, sampled at a frequency of once per day. At the time the comments were submitted, the segment of the receiving stream to which the facility discharges was considered public water supply, but that designation has since been removed.

As you are probably aware, the water quality standard for fecal coliform has been replaced by E. coli for freshwater and Enterococci for salt waters. DEQ has been replacing fecal limitations with the appropriate bacteria limitation as we reissue permits. In this particular circumstance, an E. coli limitation of 126 N/100 mL (geometric mean) is being included in the permit with a monitoring frequency of 4 samples per month. The facility uses chlorine to disinfect. The facility will also be limited to a minimum TRC of 1.0 mg/L at the outlet of the chlorine contact tanks sampled every two hours to ensure disinfection is occurring.

I would like to streamline the bacteria monitoring for the facility. Given the description above, I was wondering if the proposed E. coli limitations will satisfy the concerns expressed by VDH in 1994, and thus allowing us to remove the fecal coliform limitation? If not, is there some other frequency of E. coli monitoring that might?

Please contact me either via email or phone at your earliest convenience to discuss further.

Sincerely,
Jaime

Jaime L. Bauer | Environmental Specialist II| DEQ Piedmont Regional Office | 804.527.5015 |
jaime.bauer@deq.virginia.gov

COMMONWEALTH of VIRGINIA

ROBERT B. STROUBE, M.D., M.P.H.
STATE HEALTH COMMISSIONER

Department of Health
Office of Water Programs

REPLY TO
EAST CENTRAL FIELD OFFICE
CLOVERLEAF OFFICE PARK
300 TURNER ROAD
RICHMOND, VIRGINIA 23225
PHONE: 674-2880; FAX: 674-2815

SUBJECT: HENRICO COUNTY
Sewerage - Henrico County Regional Sewage Treatment Works
VPDES Draft Permit

February 7, 1994

Mr. J. R. Bell, Jr.
Regulatory Services Supervisor
Virginia Department of Environmental Quality
Richmond Water Office
P. O. Box 11143
Richmond, Virginia 23230

Dear Mr. Bell:

On January 7, 1994, this office received a copy of the draft VPDES Permit No. VA0063690 for the Henrico County Regional Sewage Treatment Works. The treatment works include a pure oxygen activated sludge treatment scheme with ozonation disinfection and post aeration. It discharges into the James River.

Our review of the draft VPDES permit indicated that, for the interim period between the issuance of this VPDES permit and the issuance of the Certificate to Operate (CTO) for the upgraded and expanded sewage treatment works, the tiered effluent limits (12.0 mg/l - June through October; 19.0 mg/l - November through May) for $CBOD_5$ and suspended solids are being retained. Also being retained are the tiered limit (9.6 mg/l - June through October; 14.0 mg/l - November through May) for ammonia nitrogen, the limit of 2.0 mg/l for total phosphorus, the permitted effluent pH range of 6.0-9.0, the minimum permitted dissolved oxygen concentration of 5.6 mg/l, and the average (geometric mean) effluent fecal coliform level of 200 colonies/100 ml. The permitted average daily flow is unchanged at 30 mgd.

Our review of the draft VPDES permit also indicated that once the CTO for the upgraded and expanded sewage treatment works is issued, the tiered effluent limits for $CBOD_5$ and suspended solids will be proportionally reduced (8.0 mg/l - June through October; 12.7 mg/l - November through May). Also to be proportionally reduced is the tiered limit (6.4 mg/l - June through October; 9.3 mg/l - November through May) for ammonia nitrogen. Our review indicates that the limit of 2.0 mg/l for total phosphorus, the permitted effluent pH range of

Mr. J. R. Bell, Jr.
Regulatory Services Supervisor
Virginia Department of Environmental Quality
Richmond Water Office
P. O. Box 11143
Richmond, Virginia 23230

6.0-9.0, the minimum permitted dissolved oxygen concentration of 5.6 mg/l, and the average (geometric mean) effluent fecal coliform level of 200 colonies/100 ml will be retained. The permitted average daily flow will increase to 45 mgd.

The Division of Wastewater Engineering is concerned that the weekly geometric mean limit of 400 colonies/100 ml and the daily limit of 16,500 colonies/100 ml for fecal coliform have both been deleted from the draft VPDES permit. In a letter dated May 28, 1993 to Mr. Gerard Seeley, Regional Director, VDEQ - Richmond Water Office, this Division expressed its concern on raising the daily limit from 1,000 colonies/100 ml to 16,500 colonies/ml. The plans and specifications for the upgrading and expansion of the treatment works from 30 mgd to 45 mgd as prepared by Black & Veatch were forwarded to the Department of Environmental Quality with our letter report dated September 30, 1993. One of the conditions of approval was that modifications to the disinfection facility would be given the highest priority during construction of the upgrade of the treatment works. We note that the VPDES permit received on May 23, 1986 included a monthly and a weekly geometric mean limits for fecal coliform and the VPDES permit issued on August 27, 1991 included monthly and daily limits for effluent fecal coliform.

For optimum protection of public health with regard to public exposure to receiving waters and water supply use of downstream flows, large sewage treatment works such as those serving the City of Richmond and the County of Henrico should be required to monitor and report effluent fecal coliform levels several times per day. Their VPDES permits only require microbial indicator test results to be reported once per day. It is noted that VPDES Permit No. VA0063177 issued on January 6, 1992 for the City of Richmond sewage treatment works included an instantaneous limit of 1,000 colonies/100 ml for fecal coliform. This Department does not understand why the VPDES permit for Henrico County should be more lenient with respect to disinfection requirements than the permit for the City of Richmond, as the County discharge location is actually closer to a major water supply intake. In addition, disinfectant residual monitoring is not practical as a means of controling and monitoring ozonation, as with chlorination-dechlorination disinfection processes. Therefore, this office recommends that a weekly geometric mean discharge limit of 400 colonies/100 ml be included in the Henrico County VPDES permit.

This office agrees that the treatment works should be designated Reliability Class I and that a Class I licensed operator should be required.

Mr. J. R. Bell, Jr.
Regulatory Services Supervisor
Virginia Department of Environmental Quality
Richmond Water Office
P. O. Box 11143
Richmond, Virginia 23230

In conclusion, this Department recommends approval of the proposed VPDES permit for the Henrico County Regional sewage treatment works with the condition that either a weekly limit (geometric mean) of 400 colonies/100 ml or a daily limit of 16,500 colonies/100 ml (in accordance with the Consent Order issued by your Department in June 1993) shall be included in the interim permit, and either a weekly limit (geometric mean) of 400 colonies/100 ml or a daily limit of 1,000 colonies/100 ml shall be included in the final permit.

If we can be of further assistance, please contact Randall L. Morrissette at 674-2886.

Sincerely,

L. M. Brown, P.E.
Engineering Field Director
East Central Environmental Engineering Field Office

RLM/bas
cc: VDH - Central Office, DWE

Attachment 13 – 2010 TMDL Fact Sheet

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River**

TMDL ID: **G01E-01-BAC** **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.2581 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1996

UPSTREAM LIMIT: Fall Line (Mayos Bridge)

DOWNSTREAM LIMIT: Appomattox River

Estuarine James River from the fall line at Mayos Bridge downstream to the Appomattox River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Recreation Use - Not Supporting

IMPAIRMENT: E.coli

The James River from the fall line to the Appomattox River has been assessed as not supporting of the Recreation use support goal based on the results of a summer special study in the fall zone. The special study was designed to monitor the effects of summertime rain and combined sewer overflow (CSO) events on water quality in the James River and to monitor the effects of Richmond's CSO abatement efforts.

The segment has been included on the Impaired Waters list for fecal coliform since 1996. During the 2004 and 2006 cycles, the bacteria standard changed to E.coli for those stations with enough data. Some of the areas in this segment had converted to the E.coli standard, for others the fecal coliform standard was still in effect. During the 2008 cycle, the impairment was converted solely to E. coli. The TMDL for bacteria is due in 2010.

Bacteria impairment is noted at the following stations during the 2010 cycle:
2-JMS110.30
2-JMS104.16
2-JMS099.30

Although station 2-JMS087.01 is currently passing (5/50), the downstream extent will remain the same for this cycle due to the historical impairment and the marginal passing rate.

Farrar Gut was mistakenly combined with the mainstem in previous assessments. The stream is a separate waterbody and should not be included in the bacterial impairment, which only included the "estuarine James River".

IMPAIRMENT SOURCE: NPS - Urban, CSO

The source of the impairment in this section of the river is believed to be urban runoff from the tributary drainage basin and from combined sewer overflow events from the City of Richmond's combined sewer system.

The City is currently undertaking CSO abatement efforts. It is recommended that the ongoing CSO special study be continued to gauge the effects of CSO abatement efforts on water quality in this segment.

RECOMMENDATION: Problem Characterization

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River and Various Tributaries**

TMDL ID: **G01E-03-PCB** **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2014

IMPAIRED SIZE: ~325 - Stream mile **Watershed:** VAP-G01E

INITIAL LISTING: 2002

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Hampton Roads Bridge Tunnel

Estuarine James River from the fall line to the Hampton Roads Bridge Tunnel, including several tributaries listed below.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Fish Consumption Use - Not Supporting

IMPAIRMENT: Fish Tissue - PCBs, VDH Fish Consumption Restriction

During the 2002 cycle, the James River from the Fall line to Queens Creek was considered not supporting of the Fish Consumption Use due to PCBs in multiple fish species at multiple DEQ monitoring locations.

During the 2004 cycle, a VDH Fish Consumption Restriction was issued from the fall line to Flowerdew Hundred and the segment was adjusted slightly to match the Restriction. In addition, in the 2004 cycle, the Chickahominy River from Walkers Dam to Diascund Creek was assessed as not supporting the Fish Consumption Use because the DEQ screening value for PCBs was exceeded in 3 species during sampling in 2001.

During the 2006 cycle, the VDH restriction was extended on 12/13/2004 to extend from the I-95 bridge downstream to the Hampton Roads Bridge Tunnel and include the tidal portions of the following tributaries:

Appomattox River up to Lake Chesdin Dam
Bailey Creek up to Route 630
Bailey Bay
Chickahominy River up to Walkers Dam
Skiffes Creek up to Skiffes Creek Dam
Pagan River and its tributary Jones Creek
Chuckatuck Creek
Nansemond River and its tributaries Bennett Creek and Star Creek
Hampton River
Willoughby Bay and the Elizabeth R. system (Western, Eastern, and Southern Branches and Lafayette R.) and tributaries St. Julian Creek, Deep Creek, and Broad Creek

The advisory was modified again on 10/10/2006 to add Poythress Run.

The impairments were combined. The TMDL for the lower extended portion is due in 2018.

Farrar Gut was mistakenly combined with the mainstem in previous assessments. The stream is a separate waterbody and is not included in the VDH Fish Consumption Advisory.

IMPAIRMENT SOURCE: Unknown

The source of the PCBs is considered unknown.

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River Tidal Freshwater (Upper) Estuary**

TMDL ID: **JMSTFU-DO-BAY** **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.5749 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1998

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Tidal Freshwater/Oligohaline Boundary

The James River Tidal Freshwater Upper estuary, which extends from the fall line to approximately the Appomattox River, including tributaries.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting

IMPAIRMENT: Dissolved Oxygen

The mainstem James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

The CB water quality standards were implemented during the 2006 cycle. The 30-day dissolved oxygen criteria was met during the 2006 and 2008 cycles; however, during the 2010 cycle, the segment failed the summer 30-day Open Water dissolved oxygen criteria. The rest-of-year standard was met.

IMPAIRMENT SOURCE: Nonpoint Source, Point Source

The tributary strategy for the James River assigned sources and allocations.

RECOMMENDATION: Problem Characterization

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River Tidal Freshwater (Upper) Estuary**

TMDL ID: **JMSTFU-SAV-BAY** **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.5998 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1998

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Tidal Freshwater/Oligohaline Boundary

The James River Tidal Freshwater Upper estuary, which extends from the fall line to approximately the Appomattox River, including tributaries.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting, Shallow Water Use - Not Supporting

IMPAIRMENT: Aquatic Macrophytes

The mainstem James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

During the 2006 cycle, the CB water quality standards were implemented. The Upper Tidal Freshwater James River from the fall line to the Appomattox fails the Shallow Water Use SAV criteria.

IMPAIRMENT SOURCE: Nonpoint Source, Point Source

The tributary strategy for the James River assigned sources and allocations.

RECOMMENDATION: Problem Characterization

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River**

TMDL ID: **G01E-02-CHLA** **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 5.5117 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 2008

UPSTREAM LIMIT: Fall Line (Mayos Bridge)

DOWNSTREAM LIMIT: Appomattox River

Mainstem James River from the fall line at Mayos Bridge downstream to the JMSTFu/JMSTFl boundary at the Appomattox River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting, Open Water Subuse - Not Supporting

IMPAIRMENT: Chlorophyll

The James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

A special site-specific chlorophyll standard for the mainstem James River was adopted during the 2008 cycle. The upper tidal freshwater segment exceeds both the spring and summer seasonal means.

Farrar Gut was mistakenly combined with the mainstem in previous assessments. The stream is a separate waterbody and should not be included in the chlorophyll a impairment, which only includes the mainstem James River.

IMPAIRMENT SOURCE: Point sources, Nonpoint Sources

The James River Tributary Strategy was developed to bring the river into attainment.

RECOMMENDATION: Problem Characterization

Attachment 14 – Nutrient Upgrade CTO (July 25, 2011)

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Blue Ridge Regional Office
www.deq.virginia.gov

David K. Paylor
Director

Douglas W. Domenech
Secretary of Natural Resources

Robert J. Weld
Regional Director

Lynchburg Office
7705 Timberlake Road
Lynchburg, Virginia 24502
(434) 582-5120
Fax (434) 582-5125

Roanoke Office
3019 Peters Creek Road
Roanoke, Virginia 24019
(540) 562-6700
Fax (540) 562-6725

July 25, 2011

LOCATION: Henrico County
Receiving Facility: Henrico WRF
Project: Nutrient Upgrades Phase 7 CTO
PT No.: CTC, 22914; CO, 24935; Interim Authorization, 22914; CTO, 25236

Arthur D. Petrini, P.E., Director
Department of Public Utilities
P.O. Box 27032
4601 Parham Road
Richmond, Virginia 23273-7032

Dear Mr. Petrini:

In accordance with 9 VAC 25-790-190 of the Commonwealth of Virginia's *Sewage Collection and Treatment Regulations*, enclosed is a Certificate to Operate (CTO) for the Henrico sewage treatment works. The CTO is being issued following substantial completion of the project as described in the Certificate to Construct (CTC) dated September 24, 2007, with reference PT number 22914 and subsequent change orders were approved through PT number 24935. Interim authorization for the operation of Trains 11 and 12 was approved through PT number 22914. The engineer's Statement of Completion is dated May 4, 2011 and was received on May 6, 2011. A CTO inspection was conducted by DEQ on June 15, 2011. At the time of the inspection, all treatment components were installed and functional.

Should you have any questions or comments regarding this matter, please feel free to contact me at (540) 562-6708.

Sincerely,

Gary P. Phillips, P.E.
Wastewater Engineer

Enclosures

cc: James C. M. Grandstaff, Division Director - Henrico County DPU (via email)
Alan Stone, P.E.; Francis Buser, P.E. - Hazen and Sawyer (via email)
Jaime Bauer - PRO; Art Buehler, Allan Brockenbrough, P.E. - CO (via email)
Henrico County Building Official; P.O. Box 90775; Henrico, VA 23273-0775
West Henrico Health Department; P.O. Box 90775; Henrico, VA 23273-0775

CERTIFICATE TO OPERATE

OWNER: Henrico County

FACILITY/SYSTEM NAME: Henrico WRF

PERMIT NUMBER: VA0063690

DESCRIPTION OF FACILITY/SYSTEM:

This CTO addresses the nutrient upgrade of the treatment works for the Henrico WRF. The sewage treatment works has been designed for an average daily flow of 75 MGD and a peak flow of 150 MGD based on a 2.0 peak factor. The facility is designed to comply with the draft VPDES permit VA0063690 which has the following monthly average effluent limitations: 4.8 mg/L and 7.6 mg/L $cBOD_5$ (June-Oct. and Nov.-May, respectively); 8.0 mg/L TSS; 3.8 mg/L and 5.6 mg/L Ammonia-N (June-Oct. and Nov.-May, respectively) and 28 µg/L TRC. The facility is designed to comply with an annual average total nitrogen concentration of 5.0 mg/L and an annual average total phosphorus concentration of 0.5 mg/L. In addition, the facility will comply with a pH range of 6.0-9.0 S.U.; a geometric mean of 126 N/CML of *E. coli*; and a minimum DO of 5.6 mg/L.

The project consisted of construction of two, new secondary biological treatment trains (11 and 12) and retrofitting two existing trains (9 and 10). All four trains were configured for 5-stage nutrient removal, with the ability to operate in a 3-stage mode to adapt to temperature or other changes. Provisions were added for supplemental carbon for denitrification and for chemical removal of phosphorus. Tanks 1-4 will be removed from service.

This facility has been designated Reliability Class I and meets the requirements of this classification with dual power feed with automatic transfer; onsite audio/visual alarms for critical systems; process control monitoring of critical systems; and transmission of critical alarms via telemetry to plant personnel.

AUTHORIZATION TO OPERATE:

The owner is authorized to **conditionally** operate this facility in accordance with Section 190 of the Commonwealth of Virginia's *Sewage Collection and Treatment Regulations* with the following condition, an operation and maintenance manual for the facility is to be submitted to the Piedmont Regional Office for approval in accordance with the facility's VPDES permit.

ISSUED BY:

Gary P. Phillips, P.E.
Chesapeake Bay Program, Wastewater Engineer
Department of Environmental Quality

July 25, 2011
Date

Attachment 15 – Owner Comments and Agency Response

COMMONWEALTH OF VIRGINIA
COUNTY OF HENRICO

DEPARTMENT OF PUBLIC UTILITIES

ARTHUR D. PETRINI, P.E.
DIRECTOR
(804) 501-4517

April 10, 2012

Ms. Jamie Bauer,
Environmental Specialist II
Piedmont Regional Office
Department of Environmental Quality
4949-A Cox Road
Glen Allen, Virginia 23060-6295

Certified Mail
Return Receipt Requested

RE: Henrico County WRF VPDES VA0063690
Comments Regarding 3/6/12 Draft Permit

Dear Ms. Bauer:

In response to your letter dated March 6, 2012, requesting comments and questions for the subject facility's draft public notice document and draft permit and supporting documents, the County offers the following:

1. On Page 16 of 17, first paragraph, last sentence, "Compliance with ***TSS (Total Suspended Solids)***.....in the permit will demonstrate compliance with the *Richmond Crater (-Interim) Water Quality Plan*" (*Plan*) Request for Clarification: is the TSS (total suspended solids) parameter addressed in the *Plan*?

2. On page 3 of 17, item No. 16, DEQ states, "WRF was allocated wasteloads (for $cBOD_5$ and ammonia) based on a design flow of 38.07 MGD (used in Draft FS Attachment 8 Table B7) when the *Plan* was established. Since that time, the Henrico WRF has expanded to 75 MGD. While the wasteload allocations … remain unchanged, the expanded flow results in a change in concentration of these parameters". Comments: a review of the *Plan* we have on file indicates the WLAs presented in the draft permit are consistent with the *Richmond-Crater 208 Interim Water Quality Management Plan*, dated December 1982. In this document, WLAs for ammonia and $cBOD_5$ appear to be allocated (same lbs/day values as presented in the draft permit) to Henrico County for a "proposed" sewage treatment plant with a ***30 MGD*** flow value. Given theses allocations were established over 30-years ago, the advances in technology, modeling and advances in science since that time, the development of the TMDL and other regulatory processes, the repeal of *9 VAC 25-570* (RE: the *Plan* and the WLA established by the *Plan*), and the fact that the methodology employed by the DEQ to calculated cBOD5 concentration limits (1982 WLA and design flow) is NOT sustainable (at 150 MGD the limitation for the cBOD5 parameter – summer monthly average limitation would approach the quantification limitation for this parameter 2.0 mg/L);

the County would like to state for the record that we believe the process and potentially the original science used to establish these WLA values (and resultant concentration limitations) is suspect at best and should not be cited in future permits as the (only) basis to establish permit waste load allocations and concentration limitations.

3. *Draft Fact Sheet,* No. 26, The DEQ makes reference to an aggregate TSS allocation on the James River segment in question (Virginia Final WIP document 12/2011). Request: The County would like to know what portion of the total allocation will be assigned to the Henrico County WRF (VPDES OF 001) and / or the basis for determining this allocation.

4. Comment: *Draft Fact Sheet,* Page 5 of 17, DEQ comments specific to hydrogen sulfide, , appears to contradict, "NL monitoring only" specified in *Table 3: Permit Limitations and Basis* of the *Draft Fact Sheet.*

5. Again, *Fact Sheet,* Page 5 of 17, DEQ comments specific to hydrogen sulfide, "Best Engineering Judgment" (BEJ) is specified in *Table 3: Permit Limitations and Basis,* as the basis for the monitoring requirement, and the following statement, "Analysis of the data in STATS.exe indicates that a limitation for hydrogen sulfide is necessary to protect water quality". Questions: what is the water quality standard (in-stream acute and/or chronic concentration standard(s) OR science behind this BEJ) for hydrogen sulfide AND, given our mixing and dilution data, what final effluent concentration value (at design flow) would we expect to approach the chronic standard that is "protective of water quality"?

6. Page 7 of 17, *Draft Fact Sheet,* and draft permit Part I C. 8: Compliance Reporting, the quantification limitation (QL) provided for $cBOD_5$ is 2 mg/L. Within the last two years, the DEQ has provided a $cBOD_5$ QL of 5 mg/L to permittees discharging to the same stream segment. Comment: Henrico County request a 5 mg/L QL for $cBOD_5$, OR an explanation as to why that would not be appropriate for Henrico County.

7. Draft permit, Part I A. 1. c., "At least 85% removal for BOD_5 (we assume $cBOD_5$) and TSS must be obtained for this effluent". We will assume, unless DEQ responds otherwise: a) there is no reporting mechanism for this condition – we will maintain appropriate documentation to demonstrate compliance as needed/requested; and b) the standard will be applied on an **annual average** basis; i.e., annual average influent (compared to) to annual average effluent data.

8. Draft permit, Part I C. "Special Conditions", No. 3. "Operations and Maintenance Manual Requirement", Comment: we would expect the requirement to review the Manual and provide notification to the DEQ as to completeness and accuracy to take at least 90 days (from the effective permit date). *Should* the Manual require revision, we would expect that process (due to size and complexity of both the facility and the document) to take an additional 180 days from the point in which we notify the DEQ as to the completeness and accuracy of the Manual.

Request for change: the County requests the draft permit be revised to provide 180-days (to affect revisions should they be necessary) from the date the County notifies the DEQ the Manual is not complete and accurate.

9. Draft permit, Part I D. No. 11, Request for change: the County request the draft permit be modified to, "Within 210 days of the effective date of this permit, submit ….a survey of all Industrial Users discharging to the POTW. Recent changes in how we manage and transfer data between the various software packages involved in managing the program will require additional staff time to ensure information and data are being transferred properly (a manual process to ensure the changes in the automated systems are appropriate/working properly).

10. Part I C. "Special Conditions", No. 3. "Operations and Maintenance Manual Requirement": Question: does this apply to O & M Manuals for collection sewers, pumping stations, force mains and trunk sewers?

11. Draft permit notification and reporting requirements (Parts I and II general) of the draft permit, Question: do the notification and reporting requirements (contained in Parts I and II – all applicable sections) apply to collection sewers, pumping stations, force mains and trunk sewers?

12. Part II J., "Notice of Planned Changes"; Question: does this apply to sewer conveyance system "pump around", temporary shut down of a sewage pump station to affect repairs, and routine and/or preventative maintenance and construction activities?

13. *Draft Public Notice –Environmental Permit* document, Comment: document states, "The applicant proposes to release treated sewage wastewater at a rate of 75 (MGD)…", Comment: not sure the proper wording or if there is any flexibility allowed (using the design flow value may be standard/typical/required) – we simply note the WRF annual average final effluent flow is currently much less than the design value (therefore, to us this appears to be misleading). Annual average flow for year 2011 was 40.48 MGD.

14. Draft permit and all associated documents, where applicable/referenced, please change our address to "Henrico" as this is now our official address (zip code stayed the same).

15. *Draft Fact Sheet*, page 5 of 17 and *Table 3*, the basis for the total phosphorus annual and (apparently) monthly average final effluent limitations is "Nutrient Regulations and DEQ Related Guidance". Comments: a) in case it is germane (to guidance documents or regulations), the current WQIF Grant Agreement (intentionally), does not address total phosphorus; b) the facility is not *designed* to achieve a 0.5 mg/L (or less) total phosphorus concentration limitation on a ***month to month*** basis; and c) the facility is regulated for total phosphorous (total pounds per year basis) under the VPDES General Nutrient Permit and the Chesapeake Bay TMDL. Request: given the above comments, we request no monthly or

annual average concentration limitation be applied in the individual permit; AND, if there is a regulation or guidance document that requires a monthly AND/OR annual concentration limitation for total phosphorus in the VPDES individual permit (or anywhere else), will you please provide the reference(s).

16. *Draft Fact Sheet*, page 5 of 17 and *Table 3*, and draft permit Part 1 A. "Limitations and Monitoring Requirements", monthly average (column): the DEQ has *apparently* specified monthly and annual average limitations for total nitrogen. Comments: The facility is regulated for total nitrogen (total pounds per year basis) under the VPDES General Nutrient Permit and the Chesapeake Bay TMDL. The facility is also required to meet an annual average total nitrogen limitation of 5.0 mg/L in accordance with the terms of the Water Quality Grant Agreement document; therefore, we do not necessarily object to this annual average limitation being "carried over" to the VPDES Permit. However, since we would be penalized under the Grant Agreement for failure to comply with the concentration limitation (monetary penalties for exceeding the standard 5.0 mg/L by more than 10%), it would appear to be "double jeopardy" to also be penalized under the VPDES Individual Permit for the same. Request: if an ***annual*** average total nitrogen limitation is required (by regulation or guidance memo), we request "No Limit" (reporting only) on the DMR; IF an annual limit is required (by regulations or guidance document) please provide reference(s). Last, with respect to a ***monthly*** average concentration limitation for total nitrogen, the WRF is not *designed* to achieve a 5 mg/L (or less) total nitrogen concentration on a ***month to month*** basis; therefore, the County would have no choice but to formally object to this requirement (if it is actually a requirement). If a monthly average limitation is required, please provide reference(s).

If you have any questions or require additional information, please do not hesitate to contact me directly at 804-795-9302.

Sincerely,

James C. M. Grandstaff
Division Director, WRF

/jcmg

Digital Copies:
Arthur Petrini, P.E.
William Mawyer, P.E.
Chris Tabor, P.E., Hazen and Sawyer

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

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Doug Domenech
Secretary of Natural Resources

David K. Paylor
Director

Michael P. Murphy
Regional Director

April 20, 2012

Mr. James Grandstaff
Division Director, WRF
Henrico County
9101 WRVA Road
Henrico, VA 23231

Subject: Response to Owner Comments of VPDES Draft Permit VA0063690 – Henrico County WRF

Dear Mr. Grandstaff:

I have reviewed your letter dated April 10, 2012 with the subject of "Henrico County WRF VPDES VA0063690 Comments regarding 3/6/12 Draft Permit." Please find below responses to the various concerns or questions expressed by Henrico County:

1. Fact Sheet Item No. 26 (page 16) - TSS is not a parameter addressed in the Richmond Crater Water Quality Management Plan. However, increased concentrations of TSS in receiving waters may contribute to low dissolved oxygen concentrations. Therefore, it is believed that compliance with the permit limitations for TSS will assist in meeting the wasteload allocation established in the Richmond Crater Water Quality Management Plan.

2. Fact Sheet Item No. 16 (page 3) – The Richmond-Crater Interim Water Quality Management Plan in 9 VAC 25-570 was repealed along with other management plans and replaced with 9 VAC 25-720 et.seq. The wasteload allocations in the Richmond-Crater Interim Water Quality Management Plan are included in Table B7 of 9 VAC 25-720-60. DEQ understands the concerns expressed by Henrico County that the wasteload allocations were established based on plant design capacity from approximately 30 years ago and have not been adjusted based on increases in plant design capacity. However, these wasteload allocations are a regulatory requirement and must be including the permit until such time that the Richmond Crater Water Quality Management Plan is revised. The Water Quality Management Planning Regulation can be viewed at http://lis.virginia.gov/000/reg/TOC09025.HTM.HTM#C0720.

3. Fact Sheet Item No. 16 (page 3) - At this time individual TSS allocations for the James River segment JMSTF2 have not been established. It is my understanding that these allocations will be determined in Phase II of Watershed Implementation Plan. I have sent Henrico County's comments regarding TSS to the DEQ Central Office staff in charge of establishing the allocations. Upon further development such as how the allocations are going to be calculated and what allocation Henrico WRF will be assigned, I will contact you with the details.

4. Fact Sheet Item No. 16 (page 5) - The evaluation for hydrogen sulfide based on the data that was reported with the application indicated that a permit limitation for hydrogen sulfide is necessary to protect water quality. However, at this time, the agency does not believe that the conventional permit limitation evaluation is appropriate for this parameter. Reported values for hydrogen sulfide are calculated values based on measured concentrations of dissolved sulfide, pH at the time the sample is taken, as well as other measured parameters. The agency believes that it is more appropriate for reported concentrations of dissolved sulfide to be evaluated rather than the previously reported values of hydrogen sulfide. Both the fact sheet discussion on page 5 states that dissolved sulfide monitoring is being required so that additional data can be collected and evaluated during the next permit reissuance, and no permit limitation is being established at this time.

5. Fact Sheet Item No. 16 (page 5) - The reference to *best engineering judgment* in Table 3 refers to the staff decision to require monitoring only for hydrogen sulfide and not include a permit limitation at this time. The Virginia Water Quality Standards (January 6, 2011) establishes a chronic standard for hydrogen sulfide at 2.0 ug/L in ambient freshwater and saltwater. There is no acute water quality standard for hydrogen sulfide. At this time, based on the measured effluent concentration of hydrogen sulfide submitted with the permit application, dilution ratios, and mixing, Henrico County would be required to meet a hydrogen sulfide permit limitation of 23.4 ug/L based on chronic toxicity. This evaluation is shown in Attachment 10 of the fact sheet attachments labeled *STATS.exe EVALUATION*.

6. Permit Special Condition Part I.C.8 - DEQ previously established the quantification level (QL) for BOD_5 and $cBOD_5$ as 5 mg/L. However, the most recent approved EPA test methods for BOD set the quantification level at 2 mg/L. In the past year, DEQ has begun of revising BOD_5 and $cBOD_5$ QLs in individual and general permits as they are reissued.

7. Permit Special Condition Part I.A.1.c – At this time, there is no reporting requirement to demonstrate compliance with at least 85% removal for BOD_5 and TSS. This requirement exists based on the Secondary Treatment Standards in 40 CFR 133. As indicated, records should be maintained to demonstrate compliance and made available if requested.

8. Permit Special Condition Part I.C.3 - O&M Manual Requirements – Please note that DEQ recently changed the requirement that permittees submit notification that the O&M Manual is accurate and complete and that revisions be submitted within 90 days of the effective date of the permit. The revised condition requires that the permittee maintain a current and accurate O&M and that changes in practices or procedures be documented in the O&M manual within 90 days of the change. Part I.C.3 of the permit has been updated to include the revised language. This language can be found under Appendix A below. Additionally, the previous permit required that the O&M Manual remain update. Therefore, DEQ does expect that additional time is warranted in reviewing and updating the O&M Manual.

9. Permit Special Condition Part I.D.11 – The due date for the Pretreatment Industrial User Survey has been revised. The permit now requires that the survey be submitted within one year of the effective date of the permit. This change should satisfy the needs of the County.

10. Permit Special Condition Part I.C.3 – The O&M Manual requirements as listed in the individual permit apply to the treatment plant. However, the O&M manual for those parts of the collection system

should be accurate, complete, and established in accordance with 9 VAC 25-790 of the Sewage Collection and Treatment Regulations.

11. Permit Special Condition Parts I and II - Notification and Reporting Requirements - The notification and reporting requirements in Parts I and II of the permit apply to the treatment plant. However, please note any unauthorized discharges, overflows, unusual, or extraordinary discharges whether at the permitted facility or within the sewer conveyance system should be reported.

12. Permit Part II.J *Notice of Planned Changes* – This condition applies to the permitted facility and does not apply to sewer conveyance system pump around, temporary shutdown of a sewage pump station to affect repairs, and routine and/or preventative maintenance and construction activities. However, keep in mind that you may want to provide notification for any changes or working performed in the system that have the potential an environmental impact.

13. Draft Public Notice –The public notice language states that "the applicant proposes to release treated sewage wastewater at a rate of 75 MGD." The public notice language is based on the design flow of the plant as expressed in the most current CTO and VPDES permit application. Although the actual flow from the Henrico County WRF is much less than 75 MGD, the treatment plant has the potential and is permitted to discharge up to the design capacity of 75 MGD.

14. Draft Permit, Fact Sheet, and Public Notice – The treatment plant and owner address has been updated to reflect the city as "Henrico" rather than "Richmond."

15. Fact Sheet Item 16 (page 5) – Please note that the permit <u>does not</u> establish a monthly average concentration for total phosphorus (TP). As listed in the draft permit and fact sheet, the limitation is in terms of an annual average concentration. The misunderstanding may be because the limitation is listed in the "Monthly Average" column, but the placement of the limitation in this column is merely because of format of the limitation table. Indication that this concentration is in terms of annual average concentration is reflected in the name of the parameter in the far left column of Part I.A.1 as "Total Phosphorus – Annual Average."

    As required by section 62.1-44.1:15.A of the *Code of Virginia*, 9 VAC 25-40-70 *Strategy for Chesapeake Bay Watershed*, and Guidance Memo 07-2008, Amendment No.2 - *Permitting Considerations for facilities in the Chesapeake Bay Watershed*, technology based effluent concentration limitations are placed in individual permits when a facility installs technology controls for nitrogen and phosphorus through construction, expansion, or upgrade of the treatment plant. While the current WQIF Grant Agreement does not address TP, the TP annual average concentration limitation is based on the preliminary engineering reports, CTC, and CTO approved by the staff in the DEQ Office of Wastewater Engineering (OWE). Based on the design plans, the staff in OWE determined that the proposed nutrient upgrades would result in an effluent with an annual average TP concentration of 0.5 mg/L or less. Procedures for establishing concentration limitations for individual permits are listed on page 10 of Guidance Memo 07-2008, Amendment No.2 - *Permitting Considerations for facilities in the Chesapeake Bay Watershed*. Therefore, an annual average TP concentration limitation must be placed in the individual VPDES permit.

16. Fact Sheet Item 16 (page 5) – Please note that the permit <u>does not</u> establish a monthly average concentration for total nitrogen (TN). As listed in the draft permit and fact sheet, the limitation is in terms of an annual average concentration. The misunderstanding may be because the limitation is

listed in the "Monthly Average" column, but the placement of the limitation in this column is merely because of format of the limitation table. Indication that this concentration is in terms of annual average concentration is reflected in the name of the parameter in the far left column of Part I.A.1 as "Total Nitrogen – Annual Average."

As mentioned in item 15 above, section 62.1-44.1:15.A of the *Code of Virginia*, 9 VAC 25-40-70 *Strategy for Chesapeake Bay Watershed*, and Guidance Memo 07-2008, Amendment No.2 - *Permitting Considerations for facilities in the Chesapeake Bay Watershed* require that technology based effluent concentration limitations be placed in individual permits when a facility installs technology controls for nitrogen and phosphorus through construction, expansion, or upgrade of the treatment plant. Therefore, the annual average TN concentration must be placed in the individual VPDES permit and corresponding DMR.

As stated in your comments, failure to comply the TN annual average concentration limitation of 5.0 mg/L would result in a violation of the permit limitations in Part I.A.1 of the VPDES individual permit and exceedance of that concentration by greater than 10% would result in a violation of the terms of the WQIF Grant Agreement. However, DEQ does not believe that this is a situation of *double jeopardy*. Through the WQIF Grant program, Henrico County requested to obtain state funds to install nutrient control technology that was determined to be able to meet TN annual average concentration limitations of 5.0 mg/L. Any "monetary assessments" associated with violating the terms of the grant agreement are intended to recoup grant monies expended on unsuccessful nutrient removal and are unrelated to VPDES permit noncompliance.

Additionally, as mentioned in items 8 and 10 above, the revised O&M Manual Requirement Special Condition is enclosed in Appendix A. Please let me know if the responses above satisfy the questions regarding the draft permit or if you would like to discuss any of these issues further. I would like to proceed with sending the draft permit to the newspaper, but would like to have your concurrence before doing so.

Sincerely,

Jaime L. Bauer
VPDES/VPA Water Permits Writer

Appendix A – Revised O&M Manual Requirement

3. **Operations and Maintenance Manual Requirement** The permittee shall maintain a current Operations and Maintenance (O&M) Manual for the treatment works that is in accordance with Virginia Pollutant Discharge Elimination System Regulations, 9VAC25-31 and (for sewage treatment plants) Sewage Collection and Treatment Regulations, 9VAC25-790.

   The O&M Manual and subsequent revisions shall include the manual effective date and meet Part II.K.2 and Part II.K.4 Signatory Requirements of the permit. Any changes in the practices and procedures followed by the permittee shall be documented in the O&M Manual within 90 days of the effective date of the changes. The permittee shall operate the treatment works in accordance with the O&M Manual and shall make the O&M manual available to Department personnel for review during facility inspections. Within 30 days of a request by DEQ, the current O&M Manual shall be submitted to the DEQ Regional Office for review and approval.

   The O&M manual shall detail the practices and procedures which will be followed to ensure compliance with the requirements of this permit. This manual shall include, but not necessarily be limited to, the following items, as appropriate:

   a. Permitted outfall locations and techniques to be employed in the collection, preservation, and analysis of effluent, storm water and sludge samples;

   b. Procedures for measuring and recording the duration and volume of treated wastewater discharged;

   c. Discussion of Best Management Practices, if applicable;

   d. Procedures for handling, storing, and disposing of all wastes, fluids, and pollutants characterized in Part I.B.9 that will prevent these materials from reaching state waters. List type and quantity of wastes, fluids, and pollutants (e.g. chemicals) stored at this facility;

   e. Discussion of treatment works design, treatment works operation, routine preventative maintenance of units within the treatment works, critical spare parts inventory and record keeping;

   f. Plan for the management and/or disposal of waste solids and residues;

   g. Hours of operation and staffing requirements for the plant to ensure effective operation of the treatment works and maintain permit compliance;

   h. List of facility, local and state emergency contacts; and,

   i. Procedures for reporting and responding to any spills/overflows/treatment works upsets.

   .

Attachment 16 – Public Comments Received and Agency Response

June 4th, 2012

VIA ELECTRONIC MAIL

Jaime Bauer
Piedmont Regional Office
Virginia Department of Environmental Quality
4949-A Cox Road
Glen Allen, VA 23060

RE: Comments on Draft VPDES Permit for Henrico County Water Reclamation Facility (No. VA0063690)

Dear Ms. Bauer,

Thank you for providing James River Association with the opportunity to comment on draft VPDES permit No. VA0063690, for the Henrico County Water Reclamation Facility (Henrico WRF). James River Association (JRA) is a conservation organization that has been solely dedicated to restoring and protecting the James River for over thirty years. Our thousands of members and supporters have important economic, professional, and aesthetic interests in the health of the James River, and JRA is pleased to offer a voice for the River and its stakeholders through these public comments.

JRA staff utilizes the James River for scientific study, educational programs, and recreational purposes that are vital to our mission. JRA owns land and holds a lease to other property adjacent to the James River giving it valuable economic interests in protecting water quality. JRA's members enjoy a wide range of recreational activities, including fishing, swimming, and boating, throughout the James River Basin and in other Virginia water bodies. Thus, JRA and our members have direct, substantial, past, and ongoing interests that will be affected by this regulatory action.

JRA appreciates the time and effort spent by the Department of Environmental Quality to update the Henrico WRF permit, and provide related information to the public. After reviewing the changes put forth in the draft permit, JRA would like to cite a few concerns regarding protection of water quality and designated uses.

JRA would like to see permit discharge limitations clearly demonstrated to be consistent with water quality standards, the Bay TMDL, and local TMDL's. JRA applauds the move to the more stringent nutrient concentration average stipulated in the draft Henrico WRF permit, which reflects the significant improvements in treatment technology taken on by the Henrico WRF. But JRA is concerned that the shift from monthly average concentration limitations, to annual concentration limitations may result in diminished water quality protections or excess nutrient loading during certain months. Issues of

seasonality must be taken into account to allow for successful achievement of water quality standards – particularly those set for chlorophyll *a* in the Lower James River basin.

The additional spreading of nutrient limitations across multiple permits – specifically to the nutrient general permit – may add confusion to the permittees duties and ultimately interfere with DEQ's work to implement TMDL's. JRA encourages DEQ to clarify these requirements so that permits address issues of seasonality, ensure that water quality standards are met at all times during the year, and clearly show relationships between the nutrient general permit and the Henrico WRF permit to meet loading requirements.

Frequency of E.coli monitoring must allow for accurate representation of water quality conditions. JRA understands the decision to replace fecal coliform testing with E. coli, but would like to raise concerns with the reduced frequency of testing from once a day to four times per month. More frequent testing may be necessary to accurately measure bacteria concentrations, and the facility has already shown an ability to meet daily monitoring requirements through its previous permit. Henrico WRF's history of sewage overflows demonstrates the need for a strong bacteria monitoring plan to protect public health and to achieve standards in the recently completed James River bacteria TMDL.

Given the permittees history of permit violations and consent orders, DEQ must do due diligence in revising this permit to include all necessary limitations and monitoring requirements that will ensure compliance and alignment with TMDLs. Henrico WRF discharges into a segment of the James on the 303(d) list of impaired waters for dissolved oxygen, E. Coli, chlorophyll – as well as other impairments for aquatic life, and fish consumption advisories. It is of the utmost importance that new permits protect water quality, rather than present new obstacles in achieving a fishable and swimmable waterway.

Thank you for providing JRA with the opportunity to offer these comments, and JRA looks forward to the continuing dialogue and work with DEQ in protecting water quality and the health of the James River . Please feel free to contact us at (804) 788-8811 if you have any questions or concerns regarding these comments.

Very respectfully,

William Street
Executive Director
James River Association

Jameson Brunkow
Lower James Riverkeeper
James River Association

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

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David K. Paylor
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June 13, 2012

Mr. William Street
Executive Director
James River Association
South 12 Street, 4th Floor
Richmond, Virginia 23219
bstreet@jrava.org

Mr. Jameson Brunkow
Lower James Riverkeeper
James River Association
South 12 Street, 4th Floor
Richmond, Virginia 23219
jbrunkow@jrava.org

Re: *Response to Comments on Draft VPDES Permit Henrico County Water Reclamation Facility (No. VA0063690)*

Dear Mr. Street and Mr. Brunkow:

Please find below the Virginia DEQ's response to the comments you submitted on behalf of the James River Association dated June 4, 2012 in response to the draft VPDES permit VA0063690 for the Henrico County Water Reclamation Facility.

Comment: Shift of monthly average concentration limitations to annual average limitations may result in diminished water quality protections or excess nutrient loading during certain months.

Response:
The annual limitations for nutrients rather than seasonal limitations are being applied by DEQ in accordance with the attached EPA Memorandum dated March 3, 2004 regarding "Annual Permit Limits for Nitrogen and Phosphorus for Permits Designed to Protect Chesapeake Bay and its tidal tributaries from Excess Nutrient Loading under the National Pollutant Discharge Elimination System." The use of annual average limitations is also consistent with 9 VAC 25-40 *Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed* and considered to be protective of seasonal water quality concerns as discussed in the EPA memorandum.

Comment: All nutrient limitations and requirements should be included in Henrico WRF's individual permit.

Response: Section §62.1-44.19:14 of the Code of Virginia directed the State Water Control Board to establish a general permit for the discharge of total nitrogen and total phosphorus from point source discharges to the waters of the Chesapeake Bay and its tributaries. That section of the Code also states that the watershed general permit shall control in lieu of conflicting or duplicating requirements. DEQ is

obligated to issue permits in accordance with Virginia state law and therefore until such time that the law is changed, nutrient requirements will be covered under both the individual and general permits. Additionally, the individual VPDES permit contains reference to the requirements of the general permit for which the facility is registered so that the permittee is aware of other applicable requirements.

Comment: Objection to the reduced monitoring requirements for the new E.coli parameter and recommend that DEQ require at least daily monitoring.

Response: The bacterial monitoring frequency as contained in the permit is established in accordance with the DEQ VPDES Permit Manual (GM10-2003, Section MN-2, Item 4, Sampling Schedule Table). As stated in footnote 8 of the Part I.A.1 limitation table the "4 per Month" monitoring frequency "means four samples, taken at least 7 days apart, in each calendar month." Therefore, weekly bacterial monitoring is required in the permit.

Comments received in 1994 from the Virginia Department of Health were based on problems that were occurring at the plant due to the use of ozone as the method of disinfection, which was installed when the plant commenced operation. In 1994, the facility installed sodium hypochlorite storage and feed units to replace the ozone system, and has successfully been using chlorination for disinfection since that time. Additionally, the chlorine concentration is measured multiple times throughout the day at the chlorine contact tank to ensure a proper bacterial kill is being achieved and effluent quality protected. DEQ has applied the 4 per month bacterial monitoring frequency along with minimum chlorine contact tank limitations and monitoring in accordance with state policy. While the receiving stream segment to which the facility discharges is not designated as public water supply, the City of Hopewell raw water intake is located 8.1 miles downstream of the outfall. The Virginia Department of Health has concurred that the bacterial limitations as applied in the permit are appropriate for the protection of the downstream public water supply. Additionally, while Henrico County is operating under a consent decree for multiple sanitary sewer overflows, these overflows occurred in the aging public works sewer system, and not at the treatment works facility.

Comment: DEQ must do due diligence in revising this permit to include all necessary limitations and monitoring requirements that will ensure compliance and alignment with TMDLs.

Response: As part of the permitting process, prior to issuing the permit, the draft permit is reviewed by DEQ planning staff as well as EPA Region 3 staff to ensure that all applicable planning and TMDLs have been appropriately incorporated or addressed in the permit. DEQ is confident that all applicable permit limitations and monitoring are addressed in the permit as well as any TMDL requirements.

The VPDES discharge permit for the Henrico County WRF has been prepared in accordance with all applicable statutes, regulations and agency practices; the effluent limits and conditions in the permit have been established to protect instream beneficial uses and fish and wildlife resources and to maintain all applicable water quality standards. After consideration of all relevant public comments, this permit will be reissued as proposed with no subsequent changes. The final copy of the VPDES permit will be signed and available no later than June 15, 2012. If you have any questions, please feel free to contact me at 804-527-5015.

Sincerely,

Jaime L Bauer

Jaime Bauer
Water Permit Writer

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June 4, 2012

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*Via U.S. Mail and electronic mail (*jaime.bauer@deq.virginia.gov*)*

Re: Comments on Draft VPDES Permit No. VA0063690 for Henrico County Water Reclamation Facility

Dear Ms. Bauer:

The Environmental Integrity Project ("EIP") and Food & Water Watch hereby respectfully submit the following comments on draft VPDES Permit No. VA0063690 for the Henrico County Water Reclamation Facility ("Henrico WRF") located at 9101 WRVA Road, Henrico, Virginia 23231. As explained in detail below, we advise that the Virginia Department of Environmental Quality ("DEQ") substantially revise the draft permit in order to ensure compliance with the Chesapeake Bay Total Maximum Daily Load ("Bay TMDL"), the James River Total Maximum Daily Load for bacteria ("James River TMDL"), the Richmond Crater Water Quality Management Plan ("Richmond Crater WQMP"), and the Virginia water quality standards. As currently written, the draft permit is unable to ensure such compliance and fails to meet the standards of the Clean Water Act.

I. Introduction

The Henrico WRF is a large wastewater treatment facility with an average design flow of 75 million gallons per day ("MGD") to segment JMSTF2 of the James River, as designated under the Bay TMDL, in the Chesapeake Bay watershed.[1] Although 75 MGD is the average design flow, Henrico WRF has on occasions discharged over fifty percent higher than this flow and has a peak flow of 150 MGD.[2]

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[1] *See* DEQ, VPDES Permit Fact Sheet VA0063690 at 16 [hereafter "Henrico Fact Sheet"]; DEQ, Authorization to Discharge under the Virginia Pollution Discharge Elimination System and the Virginia State Water Control Law, Permit No. VA0063690 at 1 [hereafter "Henrico Draft Permit"].

[2] *See* Henrico Fact Sheet, Attachment 14, at 2 [hereafter "Nutrient Upgrade CTO"]; *See* EPA, Enforcement and Compliance History Online, Detailed Facility Report for Henrico WRF (last

The segment of the James River into which Henrico WRF discharges is listed as a 303(d) water, impaired for dissolved oxygen, E. coli, chlorophyll, aquatic macrophytes, and "Fish Tissue – PCBs, VDH Fish Consumption Restriction," for which several TMDLs have been scheduled, most recently including the bacteria TMDL in 2010 under which the Henrico WRF has received an allocation.[3] The facility also has allocations for ammonia and $cBOD_5$ under the Richmond Crater WQMP of the Virginia Water Quality Management Regulation, which is meant to limit "adverse effects to ambient dissolved oxygen and ammonia concentrations and maintain a minimum dissolved oxygen concentration of 5.0 mg/L."[4]

Henrico WRF has a significant history of permit violations, including at least two consent orders since 2003, the most recent of which has been in place since December 2010,[5] non-compliance in 11 of the past 12 quarters, six effluent exceedances in the last three years, one notice of violation in the last five years, and two formal enforcement actions in the last five years.[6] Much of the facility's non-compliance and violations have been due to sanitary sewer overflows, including at least 76 unauthorized discharges in 2009 and 2010.[7] Many of these overflows have been large, with individual overflows of up to 2.9 MGD.[8] Under the current consent order, Henrico WRF is required to undertake a series of improvements and projects through June 2018.[9]

Henrico WRF's previous permit expired on December 1, 2010.[10] Henrico WRF submitted its renewal application on June 14, 2010, and DEQ made the draft permit available for public comment on May 5, 2012.[11] Since the issuance of Henrico WRF's previous permit, several important developments have taken place, including most notably the approval of the James River and Bay TMDLs, which the draft permit is taking into account for the first time. Accordingly, in light of the facility's significant contribution of pollutants to the Chesapeake Bay, the permittee's history of violations, and the quality of the receiving waters, it is incumbent upon DEQ to revise this permit significantly to include limitations, monitoring requirements, and

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accessed June 1, 2012) [hereafter "Henrico WRF ECHO Report"]; Letter from Henrico WRF to Jaime Bauer, DEQ at 1 (April 6, 2010) [hereafter "March 2010 Upset and Noncompliance Report"] (noting that average flow between February 3 and 16, 2010, was 82.21 MGD).

[3] *See* Henrico Fact Sheet, Attachment 13, at A-525 [hereafter "2010 TMDL Fact Sheet"]; Henrico Fact Sheet, *supra* note 1, at 15.

[4] *See* Henrico Fact Sheet, *supra* note 1, at 2-3.

[5] DEQ, State Water Control Board Enforcement Action – Order by Consent Issued to Henrico County for Henrico Water Reclamation Facility VPDES Permit No. VA0063690 (Dec. 17, 2010) [hereafter "2010 Consent Order"].

[6] Henrico WRF ECHO Report, *supra* note 2.

[7] 2010 Consent Order, *supra* note 5, at 3-4.

[8] *See* DEQ, Notice of Violation, NOV No. W2009-12-P-0003, at 3 (Dec. 18, 2009).

[9] *See* 2010 Consent Order, *supra* note 5, at 10-13.

[10] *See* DEQ, Authorization to Discharge under the Virginia Pollution Discharge Elimination System and the Virginia State Water Control Law, Permit No. VA0063690 at 1 (Dec. 2, 2005) [hereafter "Henrico 2005 Permit"].

[11] *See* Henrico Fact Sheet, *supra* note 1, at 1.

other conditions sufficient to ensure compliance with these TMDLs, the Richmond Crater WQMP, and the Virginia water quality standards.

EIP and Food & Water Watch have an interest in the successful revision and reissuance of the Henrico WRF draft permit. EIP is a national nonprofit organization dedicated to advocating for more effective enforcement of environmental laws, including the Clean Water Act. EIP works to improve state and federal regulation of facilities discharging to waterbodies and to protect and improve water quality in Virginia and throughout the Chesapeake Bay watershed.

Food & Water Watch is a national nonprofit organization working to ensure that the food, water, and fish we consume is safe, accessible, and sustainably produced. So that we can enjoy and trust in what we eat and drink, Food & Water Watch helps people take charge of where their food comes from; keeps clean, affordable public tap water flowing freely to our homes; protects the environmental quality of oceans; forces government to do its job protecting citizens; and educates the importance of keeping the global commons under public control. Food & Water Watch envisions a world where all people have access to enough affordable, healthy, and wholesome food and clean water to meet their basic needs—a world in which governments are accountable to their citizens and manage essential resources sustainably.

II. The Draft Permit Must Be Amended in Accordance with the Bay TMDL

As identified and cited in greater detail below with respect to the total nitrogen and total phosphorus limitations and requirements, it is vital to the success of the Bay TMDL that certain aspects of the draft permit be revisited and revised.

First, the effluent limitations set in the permit must fully comply with the wasteload allocations set by the Bay TMDL and allocated by DEQ across James River permittees. As stated below in Parts III.A. and III.B., the concentration limitations for total nitrogen and total phosphorus as currently written do not entirely comply with these allocations and accordingly must be amended. Similarly, it is crucial that the most stringent and frequent limitations and monitoring requirements be retained in order to ensure this compliance.

Second, while we are aware that the regulations as currently written state that the nutrient general permit shall control in lieu of duplicative or conflicting mass-loading limitations and requirements, with certain exceptions,[12] we believe that the spreading of nutrient limitations and requirements across multiple permits is needlessly confusing and may thwart DEQ's efforts to successfully implement the Bay TMDL. Accordingly, we strongly encourage DEQ to streamline the regulations and general permitting scheme or at least to include the limitations and requirements by reference in individual permits in order to prevent confusion as to a permittee's duties. It is to the benefit of DEQ, permittees, and the success of the Bay TMDL that all permit requirements are clear and achievable.

[12] *See* 9VAC25-820-30.

Third, although DEQ will be using nutrient trading in furtherance of its implementation of the Bay TMDL, we do not believe nutrient trading is appropriate for Henrico WRF, given the size and significance of the facility to nutrient pollution to the Bay, the facility's history of violations, and the multiple impairments of the facility's segment of the James River. Indeed, DEQ has recognized that nutrient trading should not be allowed in certain circumstances, particularly instances between lower James and upper/mid-James facilities.[13] Similarly, DEQ has recognized that Henrico WRF's history of violations makes it a bad candidate for reduced monitoring requirements.[14] DEQ should take a similar prerogative here and not allow Henrico WRF to trade credits or wasteload allocations. Should DEQ determine to allow such trading—effectively revising Henrico WRF's and/or the other trading facility's permit—we remind DEQ of its public notice obligations under the Clean Water Act and reserve the right to comment on such trading and effective permit revision.[15]

III. Effluent Limitations and Monitoring

In addition to the general concerns with regard to the Bay TMDL, we raise a number of specific issues with respect to the draft permit's revised effluent limitations and monitoring requirements.

A. Total Phosphorous

The draft permit's revisions to the total phosphorous effluent limitations and monitoring requirements are problematic in several ways.

1. The Removal of Monthly Concentration Limitations and Requirements Violates the Clean Water Act's Anti-Backsliding Rule

First, and most notably, DEQ proposes to eliminate the monthly average concentration limitation for total phosphorous.[16] While we approve of the fact that the newly established annual average concentration limitation for total phosphorous is 0.5 mg/L and accordingly a *numeric* improvement over the previous limit of 2.0 mg/L, the outright replacement of a monthly limitation with an annual limitation is in fact a weakening of the permit conditions. Moreover, in removing this monthly limitation, DEQ will presumably be removing the requirement that total phosphorus be sampled daily,[17] ostensibly replacing it with the three times weekly monitoring

[13] *See* DEQ, 9VAC25-820-70 Registration List at 3 n.3 [hereafter "Nutrient General Permit Registration List"] ("In order to protect upstream water quality, facilities in the upper and middle James River shall not obtain wasteload allocations or compliance credits from the noted lower James River facilities.").
[14] *See* Henrico Fact Sheet, *supra* note 1, at 14.
[15] 40 C.F.R. §§ 123.25, 124.10(a)(1)(ii), 124.11.
[16] *See* Henrico Fact Sheet, Attachment 15, DEQ response to Henrico WRF comments at 3 [hereafter "DEQ Response to Comments"] ("Please note that the permit *does not* establish a monthly average concentration for total phosphorous (TP)."); Henrico Fact Sheet at 5.
[17] Henrico Fact Sheet, *supra* note 1, at 9; Henrico Draft Permit, *supra* note 1, at 1.

requirements for total phosphorus mass under the nutrient general permit.[18] As with the removal of the monthly concentration limitation, this is a further weakening of the permit conditions.

Although DEQ seems to acknowledge that the removal of the monthly concentration limitation and its monitoring requirements has implications with respect to the Clean Water Act's backsliding prohibition,[19] it has failed to offer any explanation as to how this removal would comply or otherwise be exempt from the prohibition.[20] Without such explanation, we can only conclude that this removal of the monthly limitation and its monitoring requirements is improper backsliding in violation of the Clean Water Act and its regulations.

As a further matter, this regression to a solely annual limitation also runs afoul of EPA's requirement that permits for continuously discharging publicly owned treatment works must contain "[a]verage weekly and average monthly discharge limitations."[21] DEQ must accordingly establish such limitations for total phosphorous in the revised permit, which must ensure compliance with Henrico WRF's wasteload allocation under the Bay TMDL.

Moreover, the reduced monitoring requirements run counter to DEQ's own permit manual, which states that in order "[t]o qualify for consideration of reduced monitoring requirements, the facility should not have been issued any Warning Letters, NOVs, or NULEs, or be under any Consent Orders, Consent Decrees, Executive Compliance Agreements, or related enforcement documents during the past three years."[22]

Beyond these legal prohibitions, the removal of the monthly limitation is also an ill-timed step backward, as Virginia has just begun to implement the terms of the Bay TMDL. As its name would imply, the Bay TMDL sets a daily pollutant load for the Chesapeake Bay, and accordingly breaks down its allocations into both yearly and daily wasteload allocations,[23] so replacing a monthly effluent limitation with a once-a-year average limitation runs completely counter to the goal of the TMDL. As DEQ is aware, successfully implementing a TMDL is a complicated task that involves ensuring the compliance of multiple regulated parties, and the Bay TMDL is unique in that it is the largest TMDL ever undertaken and administered by multiple permitting authorities. Accordingly, we find it troubling that DEQ would choose to roll the draft

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[18] *See* 9VAC25-820-70, Part I.E.1; DEQ, Permit Manual, Section MN-2, at 2 (Jan. 2010) ("Annual average TN and TP limitations issued in the Chesapeake Bay watershed should include sample types and frequencies consistent with those included in the watershed general permit.").
[19] *See* 33 U.S.C. § 1342(o); 40 C.F.R. § 122.44(l).
[20] Henrico Draft Permit, *supra* note 1, at 11 (explaining that the monthly total phosphorous limitation "must remain effective due to anti-backsliding until such time that the new, technology based total phosphorous concentration becomes effective on 1/1/13.").
[21] 40 C.F.R. § 122.45(d)(2).
[22] DEQ, Permit Manual, Section MN-2, at 2.
[23] *See* EPA, Chesapeake Bay Total Maximum Daily Load, Apps. Q, R (Dec. 29, 2010) (providing a daily aggregate wasteload allocation of 3769.5 lbs/day (edge of stream) and 2879.3 lbs/day (delivered to Bay tidal waters) for total phosphorous on Henrico WRF's segment of the James River).

permit back to a less frequent effluent limitation in its first reissuance of the permit since the implementation of the Bay TMDL.

Additionally, reliance on solely an annual concentration limitation fails to account for the seasonal variations in the water quantity and quality in the James River. As DEQ recognizes in its use of seasonal monthly limitations for ammonia and $cBOD_5$,[24] it is particularly important to protect the water quality of the James in summer months, given the lower flow and accordingly greater relative concentration of pollutants. Indeed, as noted in the draft permit's TMDL fact sheets, Henrico WRF's segment of the James has recently failed to meet standards for dissolved oxygen and chlorophyll during summer months, due in large part to nutrient pollution.[25] Given these seasonal impairments and DEQ's ability to include seasonal monthly limitations for other pollutants, DEQ must include seasonal limitations for total phosphorous that are protective of water quality.

Finally, we note Henrico WRF's contention that "the facility is not ***designed*** to achieve a 0.5 mg/L (or less) total phosphorus concentration limitation on a ***month to month*** basis," and its accordant request that "no monthly or annual average concentration limitation be applied in the individual permit."[26] As DEQ recognized in its response to these comments, certain limitations *must* be included in the permit, whether or not the facility requests otherwise.[27] Such is the case with monthly concentration limitations for total phosphorus. While DEQ certainly may work with Henrico WRF to ensure its compliance with such limitations, the limitations must be included.

2. The New Total Phosphorus Concentration Limitation Fails to Ensure Compliance with Henrico WRF's Wasteload Allocation

Although the new annual average limitation of 0.5 mg/L is a significant numeric improvement over the previous 2.0 mg/L, we note that, as designed, it fails to ensure compliance with Henrico WRF's total phosphorous wasteload allocation of 114,209 lbs/year.[28] When calculated against the facility's design flow of 75 MGD, the limitation of 0.5 mg/L results in the discharge of roughly 114,228 lbs/year of phosphorous.[29] While Henrico WRF may contend that 75 MGD is not the facility's typical daily flow, we note that: (a) the facility "has been designed for an average daily flow of 75 MGD and a peak flow of 150 MGD,"[30] (b) the effluent limitation was calculated using this flow,[31] (c) the draft permit contains no limit whatsoever as to the flow,[32] and (d) the facility has exceeded the 75 MGD flow on several occasions, including an

[24] Draft Permit at 1; Henrico Fact Sheet, Attachment 8, at 1.
[25] *See* 2010 TMDL Fact Sheet, *supra* note 3.
[26] *See* Henrico Fact Sheet, Attachment 15, Henrico WRF comment letter at 3-4 [hereafter "Henrico WRF Comments"] (emphasis in original).
[27] *See* DEQ Response to Comments, *supra* note 16, at 3.
[28] *See* Nutrient General Permit Registration List, *supra* note 13, at 5; 9VAC25-720-60C.
[29] *See* Henrico Draft Permit, *supra* note 1, at 1 n.1.
[30] *See* Nutrient Upgrade CTO, *supra* note 2, at 2.
[31] *See* Henrico Fact Sheet, *supra* note 1, at 5.
[32] *See* Henrico Draft Permit, *supra* note 1, at 1 n.1.

average flow over 82 MGD over two weeks in February 2010 and exceedances of over 50 percent in March and April of 2010.[33] Accordingly, DEQ must set a lower concentration limit to ensure compliance with Henrico WRF's wasteload allocation.

3. All Total Phosphorus Limitations and Requirements should be Included in Henrico WRF's Individual Permit

As we noted above, the spreading of limitations and requirements across multiple permits is needlessly confusing and may thwart DEQ's efforts to implement—and a permittee's efforts to comply with—the Bay TMDL. While we are aware that the regulations as currently written state that the nutrient general permit shall control in lieu of duplicative or conflicting mass-loading limitations and requirements, with certain exceptions,[34] we strongly encourage DEQ to streamline the regulations and general permitting scheme or at least include the limitations and requirements by reference in individual permits, in order to prevent confusion as to a permittee's duties under the multiple permits and ensure Virginia's success in implementing the Bay TMDL.

B. Total Nitrogen

Our comments with respect to the draft permit's requirements for total nitrogen largely mirror those that we have stated for total phosphorus, and we accordingly incorporate them by reference, with the exception that we recognize the previous permit did not include monthly concentration limitations for total nitrogen.

1. The Permit should Include Seasonal Monthly Concentration Limitations for Total Nitrogen

As with total phosphorus, DEQ has established a new annual average concentration limitation for total nitrogen set at 5.0 mg/L.[35] While this new limitation is a positive development and necessary to meet Henrico WRF's wasteload allocation under the Bay TMDL,[36] we advise DEQ to include seasonal monthly concentration limits for total nitrogen, as it has done for ammonia, and to restore at least weekly monitoring of the total nitrogen concentration, as existed under the previous permit.[37] Indeed, per DEQ's 2010 permit manual, "[a]nnual average TN and TP limitations issued in the Chesapeake Bay watershed should include sample types and frequencies consistent with those included in the watershed general permit"—in this case, three times weekly.[38]

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[33] Henrico WRF ECHO Report, *supra* note 6; March 2010 Upset and Noncompliance Report, *supra* note 2, at 1 (noting that average flow between February 3 and 16, 2010, was 82.21 MGD).
[34] *See* 9VAC25-820-30.
[35] *See* Henrico Draft Permit, *supra* note 1, at 1.
[36] *See* 9VAC25-720-60C
[37] *See* Henrico Fact Sheet, *supra* note 1, at 9.
[38] DEQ, Permit Manual, Section MN-2, at 2. In fact, the generally applicable requirement—i.e., outside the Bay watershed—for municipal treatment plants of Henrico WRF's flow is to include at least weekly monitoring of total nitrogen and total phosphorus. *Id.*

As noted above, inclusion of solely an annual limitation runs counter to EPA's requirement that permits for continuously discharging publicly owned treatment works must contain "[a]verage weekly and average monthly discharge limitations."[39] DEQ must accordingly establish such limitations for total nitrogen in the revised permit, both of which must ensure compliance with Henrico WRF's wasteload allocation under the Bay TMDL.

And again, the use of only annual concentration limitations is not adequate to meet the TMDL or to account for the seasonal variations in the water quantity and quality in the James River. Indeed, given that the facility has had and continues to have seasonal monthly concentration limitations for ammonia (as N) and continues to monitor the various species of nitrogen per the requirements of the nutrient general permit,[40] the capacity and ability already exists for the inclusion of seasonal monthly concentration limitations for total nitrogen.

Finally, as with total phosphorus, Henrico WRF has claimed that it "is not ***designed*** to achieve a 5 mg/L (or less) total nitrogen concentration limitation on a ***month to month*** basis."[41] Although there are certainly differences between limiting ammonia (as N) and total nitrogen, Henrico WRF has long had to comply with monthly—and, indeed, weekly—limitations for ammonia as low as 3.8 mg/L (or 1090 kg/day) in summer months.[42] Taking this in combination with Henrico WRF's obligations under the Bay TMDL and the impairments of its segment of the James particularly in summer months, we believe seasonal monthly concentration limitations for total nitrogen are achievable and necessary.

2. The New Total Nitrogen Annual Concentration Limitation Fails to Ensure Compliance with Henrico WRF's Wasteload Allocation

As with total phosphorous, the new annual average limitation of 5.0 mg/L for total nitrogen is a positive inclusion in the draft permit and a necessary step toward implementing the Bay TMDL. However, the limit fails to ensure compliance with Henrico WRF's total nitrogen wasteload allocation of 1,142,085 lbs/year.[43] When calculated against the facility's design flow of 75 MGD, the limitation of 5.0 mg/L results in the discharge of roughly 1,142,277 lbs/year of total nitrogen.[44] While an exceedance of 192 pounds of total nitrogen may seem insignificant as compared to the total wasteload allocation, such exceedances will quickly add up if allowed across all Bay jurisdictions and permittees. And, from a regulatory perspective, DEQ simply must establish permit limits that are protective of water quality standards and the TMDLs and wasteload allocations necessary to achieve them.[45] Accordingly, DEQ must set a lower concentration limit to ensure compliance with Henrico WRF's wasteload allocation.

[39] 40 C.F.R. § 122.45(d)(2).
[40] *See* 9VAC25-820-70, Part I.E.1.
[41] *See* Henrico WRF Comments, *supra* note 26, at 4 (emphasis in original).
[42] *See* Henrico Draft Permit, *supra* note 1, at 1; Henrico Fact Sheet at 9.
[43] *See* Nutrient General Permit Registration List, *supra* note 13, at 2; 9VAC25-720-60C.
[44] Henrico Draft Permit, *supra* note 1, at 1 n.1; *see* Part III.A.2, *supra*.
[45] 40 C.F.R. § 122.44(d)(1); 9VAC25-720-60C

3. All Limitations and Requirements for Nitrogen should be Included in Henrico WRF's Individual Permit

As we noted above with respect to the TMDL and total phosphorus, the removal of monitoring requirements for nitrogen and spreading them across multiple permits is needlessly confusing and may thwart DEQ's efforts to implement—and a permittee's efforts to comply with—the Bay TMDL and the water quality standards for the James River.[46] While we are aware that the regulations state that the nutrient general permit shall control in lieu of duplicative or conflicting mass-loading limitations and requirements,[47] we strongly encourage DEQ to streamline the regulations and general permitting scheme or at least include the limitations and requirements by reference in individual permits, in order to prevent confusion as to a permittee's duties under the multiple permits and ensure Virginia's success in implementing the Bay TMDL.

C. Ammonia

With respect to the draft permit's limitations and requirements for ammonia, we raise several issues implicating the ability to meet Henrico WRF's wasteload allocations and the Clean Water Act's prohibition on backsliding.

First, while the monthly concentration and mass limitations for ammonia are based directly on the wasteload allocations for Henrico WRF under the Richmond Crater WQMP,[48] as required by the Virginia Water Quality Management Regulation,[49] DEQ fails to provide any basis for why it has set the weekly concentration and mass limitations at levels that will not meet the Richmond Crater WQMP.[50] While the monthly concentration and mass limitations are calculated such that they will directly meet the *daily wasteload allocations* allowed by the Richmond Crater WQMP,[51] the weekly limitations are more than fifty percent higher and accordingly would allow the wasteload allocations to be violated by fifty percent on any given day or week. If there is an exception to the daily load established by the Richmond Crater WQMP, DEQ has failed to explain it. Accordingly, the weekly limitations as currently set do not achieve compliance with the Richmond Crater WQMP—and more broadly the Virginia Water Quality Management Regulation—and must be removed or adjusted downward.[52]

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[46] *See, e.g.*, Henrico Fact Sheet at 10-11.
[47] *See* 9VAC25-820-30.
[48] *See, e.g.*, Henrico Fact Sheet, *supra* note 1, at 4; *See* DEQ Response to Comments, *supra* note 16, at 1.
[49] *See* DEQ Response to Comments, *supra* note 16, at 1; 9VAC25-720-60.B.
[50] *See* Henrico Draft Permit, *supra* note 1, at 1.
[51] *Id.*; Henrico Fact Sheet, *supra* note 1, at 15-16; 9VAC25-720-60.B.
[52] We note Henrico WRF's comment that the application of the Richmond Crater WQMP to the growing flow of the facility will result in continually lower concentration limitations. Henrico WRF Comments, *supra* note 26, at 1-2. This is correct, and, unlike Henrico WRF, we believe that this is wholly appropriate. While it is true that the Richmond Crater WQMP was originally set in the 1980s, the wasteload allocations established thereunder must continue to apply to each facility—and facilities must continue to comply, even as they individually grow—until such time as DEQ revises and re-shifts the allocations in a way that will be equally or more protective of

Second, we note that the most stringent concentration limitation for ammonia—the summer monthly concentration limitation of 3.8 mg/L—has been revised upward to 3.84 mg/L.[53] While DEQ has stated that this is necessary in accordance with the agency's rules of precision, it has failed to explain why this revision should not be considered to be improper backsliding.[54] Accordingly, the limitation should remain at 3.80 mg/L.

D. Carbonaceous Biochemical Oxygen Demand

Similar issues exist with respect to DEQ's proposed revisions of the limitations and monitoring requirements for carbonaceous biochemical oxygen demand ("$cBOD_5$").

First, as with ammonia, the monthly concentration and mass limitations for $cBOD_5$ are based directly on the wasteload allocations for Henrico WRF under the Richmond Crater WQMP,[55] as required by the Virginia Water Quality Management Regulation.[56] Again, DEQ fails to provide any basis for why it has set the weekly concentration and mass limitations for $cBOD_5$ at levels that will not meet the Richmond Crater WQMP.[57] While the monthly concentration and mass limitations are calculated such that they will directly meet the daily wasteload allocations of the Richmond Crater WQMP,[58] the weekly limitations are—like ammonia—more than fifty percent higher and accordingly would allow the wasteload allocations to be violated by fifty percent on any given day or week. If there is an exception to the daily load established by the Richmond Crater WQMP, DEQ has given no adequate explanation of it. Accordingly, the weekly limitations as currently set do not achieve compliance with the Richmond Crater WQMP, and more broadly the Virginia Water Quality Management Regulation, and accordingly must be removed or adjusted downward.[59]

Also like the ammonia limitations, DEQ has adjusted the significant figures for the $cBOD_5$ monthly concentration limitations, though in this case the agency has rounded the limits upward to whole numbers, given DEQ's assessment that the monitoring method is not accurate enough to measure beyond whole numbers.[60] While we do not challenge whether or not the current methodology is accurate enough to measure beyond whole numbers, we do note that this rounding results in higher monthly concentration limitations for $cBOD_5$, for which DEQ has

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the water quality of the James River. As DEQ has noted, this is necessary in accordance with the anti-backsliding rule. *See* Henrico Fact Sheet, *supra* note 1, at 4.

[53] *See* Henrico Fact Sheet, *supra* note 1, at 9.

[54] *Id.* at 11.

[55] *See, e.g., id.* at 3.

[56] 9VAC25-720-60.B.

[57] *See* Henrico Draft Permit, *supra* note 1, at 1.

[58] *Id.*; Henrico Fact Sheet, *supra* note 1, at 15-16; 9VAC25-720-60.B.

[59] Again, we note Henrico WRF's comment that the application of the Richmond Crater WQMP to the growing flow of the facility will result in continually lower concentration limitations, and we object to it for the same reasons as stated above. Henrico WRF Comments, *supra* note 26, at 1-2; *see* note 52, *supra*.

[60] *See* Henrico Fact Sheet, *supra* note 1, at 3 n.3, 10.

offered no explanation with respect to the anti-backsliding rule.[61] As permitted, the revised limitations would result in discharges in exceedance of the wasteload allocations allowed by the Richmond Crater WQMP. Specifically, while the Richmond WQMP allocates 3,002 lbs/day for the summer months and 4,756 lbs/day for the winter months, the rounded limitations would allow for up to 3,129 lbs/day in the summer and 5,007 lbs/day in the winter. Accordingly, if DEQ must round the previous monthly concentration limitations to whole numbers, it must *round downward*. To do otherwise will not achieve the wasteload allocations of the Richmond Crater WQMP and encroaches upon the Clean Water Act's backsliding prohibition.

Finally, DEQ has also revised the monitoring requirements for $cBOD_5$, such that the monitoring is now once per week rather than daily.[62] DEQ has explained that this revision is pursuant to its 2010 permit manual, but it offers no explanation as to why such a weakened condition would not be subject to the anti-backsliding rule.[63] Furthermore, DEQ also fails to note that the reduced monitoring appears to run counter to another directive of the 2010 permit manual: that "[t]o qualify for consideration of reduced monitoring requirements, the facility should not have been issued any Warning Letters, NOVs, or NULEs, or be under any Consent Orders, Consent Decrees, Executive Compliance Agreements, or related enforcement documents during the past three years."[64]

Indeed, even the internal logic of DEQ's given reasoning—that, since treatment for ammonia controls treatment for BOD, the sampling frequency is now set at once per week—does not follow, given that the sampling frequency for ammonia has been and continues to be once a day.[65] That is, if ammonia treatment controls $cBOD_5$ treatment, and the facility has been able to sample both ammonia and $cBOD_5$ daily, why should the $cBOD_5$ sampling frequency be reduced? DEQ accordingly should continue to require daily monitoring of $cBOD_5$.

E. Fecal Coliform/E. coli

With respect to the concentration limitations of fecal coliform that have been replaced with a monthly concentration limitation for E. coli,[66] we do not necessarily raise objections to the replacement itself, but do have concerns as to the reduced monitoring frequency.[67] Specifically, we do not believe it is appropriate to reduce the bacterial monitoring frequency from once a day to four times per month, not only because Henrico WRF has long been able to comply with the previous daily monitoring requirements, but particularly because of the facility's recent history of sewage overflows and other violations, as well as the newly approved James River bacterial TMDL.[68] To state it more plainly, we question why DEQ choose this moment to loosen monitoring requirements for the Henrico WRF.

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[61] *Id.* at 3 n.3, 9, 10.
[62] *Id.* at 10.
[63] *Id.*
[64] DEQ, Permit Manual, Section MN-2, at 2.
[65] *Id.* at 9, 10.
[66] *Id.* at 11.
[67] *Id.* at 10, 11.
[68] *See* 2010 Consent Order, *supra* note 5, at 3-4; Henrico Fact Sheet, *supra* note 1, at 15.

DEQ's given reason is that the 2010 permit manual sets four times monthly as the minimum frequency,[69] but this is clearly the default and can be adjusted depending on individual circumstances. Indeed, as noted in DEQ's own staff comments in keeping with another requirement of the 2010 permit manual, "[t]he facility is not eligible for reduced monitoring because the facility is operating under a consent decree due to multiple sewer sanitary overflows that have occurred over the past few years."[70] And though DEQ has also provided an email confirmation from the Virginia Department of Health as to the reduced monitoring frequency,[71] it seems that many of the concerns identified in VDH's 1994 letter have not abated or have increased.[72]

To name just a few, Henrico WRF's permitted average daily flow at the time of the 1994 VDH letter was 30 MGD, with a planned upgrade to 45 MGD—just over half the current flow—and yet VDH's recommendation "for optimum protection of public health" then was that "large sewage treatment works such as those serving the City of Richmond and the County of Henrico should be required to monitor and report effluent fecal coliform levels *several times per day*."[73] Moreover, VDH recommended that a daily or at least weekly limit also be included—neither of which is in the current draft permit.[74] And finally, part of DEQ's reasoning also appears to be that, as the time of the 1994 VDH letter, "the segment of the receiving stream to which the facility discharges was considered public water supply, but that designation has since been removed."[75] While that may be the case, DEQ has also noted, in reference to the E. coli limits, that the "discharge for this facility is located 8.1 miles upstream from the City of Hopewell's water intake."[76] It is not clear how, or if, these statements square, but it would seem prudent to take the Hopewell water intake into account as a precautionary factor.

In light of the above, we object to the reduced monitoring requirements for the new E. coli parameter and recommend that DEQ require at least daily monitoring.

F. Hydrogen Sulfide

In the draft permit fact sheet, DEQ explained that, although the concentration of hydrogen sulfide provided in Henrico WRF's application was 492 µg/L—more than thirty times the chronic wasteload allocation for the waterbody—DEQ would not set an effluent limitation for hydrogen sulfide during the term of the permit and would instead only require monitoring

[69] Henrico Fact Sheet, *supra* note 1, at 11.
[70] *Id.* at 14; DEQ, Permit Manual, Section MN-2, at 2 ("To qualify for consideration of reduced monitoring requirements, the facility should not have been issued any Warning Letters, NOVs, or NULEs, or be under any Consent Orders, Consent Decrees, Executive Compliance Agreements, or related enforcement documents during the past three years.").
[71] *Id.*, Attachment 12, at 1 [hereafter "2012 VDH Email"].
[72] Henrico Fact Sheet, Attachment 12 [hereafter "1994 VDH Letter"].
[73] *Id.* at 2 (emphasis added).
[74] *Id.* at 2-3.
[75] 2012 VDH Email, *supra* note 71, at 1.
[76] Henrico Fact Sheet, *supra* note 1, at 15.

twice a year.[77] We strongly object to this conclusion and urge DEQ to set a concentration limitation for hydrogen sulfide and regular monitoring frequency that will protect the water quality criteria.

The chronic water quality criterion for hydrogen sulfide in freshwater, based on an aquatic life use designation, is 2.0 µg/L.[78] On the basis of this criterion, DEQ calculated a chronic wasteload allocation for the waterbody segment of 16 µg/L.[79] And given that Henrico WRF's reported concentration of hydrogen sulfide was more than thirty times this allocation, DEQ's model determined that an effluent limitation was necessary.[80] However, DEQ also determined, at some point in the aftermath of Henrico WRF's 2010 application but before the issuance of the draft permit nearly two years later, that a better method for determining a limitation for hydrogen sulfide would be via the monitoring of dissolved sulfide, rather than the reported total sulfide results.[81] However, instead of requiring additional samples from the permittee or conducting further analysis, DEQ decided to issue the permit without *any* limitation for hydrogen sulfide and instead to gather the data through twice-yearly sampling over the term of the permit.[82] This is simply unacceptable and an abdication of DEQ's duty under the Clean Water Act.

As DEQ is aware, it is required to issue permits with effluent limitations that are protective of local water quality standards.[83] While we agree that DEQ should always aim for scientific integrity in its analyses and calculation of limitations, this *does not* mean that DEQ can ignore its duties under the Clean Water Act and use the five-year term of the new permit as an extension of time to gather information it should have obtained during its consideration of the permit application. And it certainly does not mean that DEQ should collect only *ten data points* over the five-year term. Indeed, DEQ provides absolutely no explanation for why it cannot hold the application process open longer or require frequent monitoring, or for why its actions are not in direct violation of its obligations under the Clean Water Act.

Simply, DEQ must either set effluent limitations for hydrogen sulfide that will protect the water quality standards based on the information available or briefly forestall issuance of the permit until it obtains the data necessary to set appropriate limitations.

G. Acrylonitrile

As with DEQ's decision not to set effluent limits for hydrogen sulfide, the agency also determined not to set limitations for acrylonitrile, although Henrico WRF's data showed concentrations approaching and above DEQ's calculated human health standard for

[77] *Id.* at 4-5.
[78] 9VAC25-260-140.
[79] Henrico Fact Sheet, *supra* note 1, at 4; *id.*, Attachment 10, at 3 [hereafter "Effluent Limitation Development"].
[80] Henrico Fact Sheet, *supra* note 1, at 4-5.
[81] *Id.*
[82] *Id.*
[83] *See* 40 C.F.R. § 122.44(d)(1).

acrylonitrile.[84] We object to this conclusion and urge DEQ to set a concentration limitation for hydrogen sulfide and regular monitoring frequency that will protect the water quality criteria.

Specifically, under the water quality criteria, the human health standard for acrylonitrile is 2.5 µg/L, based on its carcinogenic properties.[85] On the basis of this criterion, DEQ calculated a wasteload allocation for the waterbody segment of 20 µg/L.[86] The three measurements submitted by Henrico WRF demonstrated acrylonitrile in the effluent at an average concentration of less than 20 µg/L and a maximum concentration of less than 50 µg/L, based on limits to the quantification levels used by Henrico WRF.[87] However, although all three samples approached the calculated human health wasteload and one exceeded it, DEQ determined that no effluent limitation was necessary on the basis that the quantification levels could not properly show whether the reported concentrations exceeded human health criteria.[88]

As with DEQ's failure to set a limitation for hydrogen sulfide, DEQ's refusal to set a limitation on the basis of incomplete or inadequate data is in contravention of its duty under the Clean Water Act. As a permitting authority, DEQ has a responsibility to set effluent limitations that will protect the water quality standards,[89] and the lack of adequate data to make this determination should not keep DEQ from setting protective standards. DEQ had ample opportunity to request more and better data during its consideration of the permit application, yet it did not do so. Indeed, DEQ has provided no explanation for why it cannot hold the application process open longer to collect such data. Furthermore, even though the samples gave an average concentration equaling the human health criteria wasteload, DEQ has also chosen not to include monitoring requirements of Henrico WRF to gather further data, as it did for hydrogen sulfide. [90]

Simply, in order to comply with its duties under the Clean Water Act, DEQ must either set effluent limitations for acrylonitrile that will protect the human health criteria based on the information available or delay issuance of the permit until it adequate data can be obtained.

IV. Other Issues

A. DEQ Should Restore the Previous Industry Survey Deadline or Use Henrico WRF's Suggested Deadline Instead

Beyond these permit conditions with respect to effluent limitations and monitoring, we also raise issue with DEQ's having extended the deadline for the submission of the survey of all

[84] Henrico Fact Sheet, *supra* note 1, at 4-5.
[85] 9VAC25-260-140.B. For waters designated as "public water supplies," which previously was the designation of this segment of the James River, the human health standard is roughly a fifth of this limit: 0.51 µg/L. *Id.*; *see* 2012 VDH Email, *supra* note 71, at 1.
[86] Henrico Fact Sheet, *supra* note 1, at 4; Effluent Limitation Development, *supra* note 79, at 1.
[87] Henrico Fact Sheet, *supra* note 1, at 4.
[88] *Id*.
[89] 40 C.F.R. § 122.44(d)(1).
[90] Henrico Fact Sheet, *supra* note 1, at 4.

industrial users discharging to Henrico WRF.[91] While the information provided by DEQ does not appear to give the previously set deadline for such submission, reference to the prior permit shows a similar requirement with a deadline of 180 days.[92] In its comments on an earlier draft of the current draft permit, Henrico WRF requested a brief extension of the deadline to 210 days,[93] and yet DEQ chose to more than double the deadline, to one full year.[94] Given that DEQ has offered no explanation for this longer extension, which came at no party's request, DEQ should restore the previous deadline of 180 days or Henrico WRF's suggested 210-day deadline.

B. DEQ's Response to Our Request Did Not Provide Facility Data Beyond March 2011

In advance of these comments and prior to DEQ's issuance of the draft permit, we requested all data, including discharge monitoring reports, two years prior from February 2012.[95] However, in its response, DEQ only provided data through March 2011, given the 2010 expiration of Henrico WRF's prior permit.[96] Given that this data may be necessary to adequately commenting on the draft permit, we reserve the right to send additional comments upon receipt of this more recent data.

V. Conclusion

We appreciate DEQ's having given us the opportunity to comment on the Henrico WRF permit. As stated herein, this revision and reissuance are particularly important in light of the establishment of the Bay and James River TMDLs, Henrico WRF's recent history of overflows and other violations, and the need to successfully control nutrient pollution in the Chesapeake Bay watershed and otherwise protect local water quality.

Accordingly, we request that DEQ use this opportunity to revise the draft permit and establish effluent limitations, monitoring requirements, and other conditions that take these issues into account and ensure full protection of the James River and the Chesapeake Bay.

Thank you for your consideration, and please do not hesitate to contact us if we can provide any additional information or comments.

[91] Henrico Draft Permit, *supra* note 1, at 10; DEQ Response to Comments, *supra* note 16, at 2.
[92] Henrico 2005 Permit, *supra* note 10, at 7.
[93] Henrico WRF Comments, *supra* note 26, at 3.
[94] DEQ Response to Comments, *supra* note 16, at 2.
[95] *See* Letter from Tarah Heinzen, EIP, to Diana Monroe, DEQ (Feb. 6, 2017); Email from Portia Calloway, DEQ, to Abel Russ, EIP (Feb. 17, 2012).
[96] *Id.*

Sincerely,

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Re: *Response to Comments on Draft VPDES Permit No. VA0063690 for Henrico County Water Reclamation Facility (WRF)*

Dear Mr. Kron and Ms. Merkel:

Please find below the Virginia DEQ's response to the comments you submitted on behalf of the Environmental Integrity Project and Food & Water Watch dated June 4, 2012 in response to the draft VPDES permit VA0063690 for the Henrico County Water Reclamation Facility.

Total Phosphorous

Comment: Removal of Monthly Concentration Limitations and Requirements Violates the Clean Water Act's Anti-Backsliding Rule.

Response: Although the reporting periods for the limitations are different, replacement of the current 2.0 mg/l monthly average total phosphorus limitation with a 0.50 mg/l annual average total phosphorus limit reduces the allowable long term phosphorus load by 75% and therefore does not constitute backsliding under the Clean Water Act. Treatment upgrades required to meet the new annual nutrient wasteload allocations at the Henrico County WRF resulted in actual phosphorus reductions of approximately 82% between 2006 and 2011.

Comment: The permit should contain average weekly and monthly discharge limitations for total phosphorus.

Response: The annual limitations for nutrients rather than monthly or weekly average limitations are being applied by DEQ in accordance with the attached EPA Memorandum dated March 3, 2004 regarding "Annual Permit Limits for Nitrogen and Phosphorus for Permits Designed to Protect Chesapeake Bay and

its tidal tributaries from Excess Nutrient Loading under the National Pollutant Discharge Elimination System." The use of annual limitations is also consistent with 9 VAC 25-40 *Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed*.

Comment: Under DEQ guidance reduced monitoring is not permitted if the facility has been issued any enforcement related documents during the past three years.

Response: The monitoring frequency for total phosphorus as listed in the individual permit was established in accordance with the *General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges* (9VAC 25-820) and *Nutrient Trading in the Chesapeake Watershed in Virginia and Permitting Considerations for Facilities in the Chesapeake Bay Watershed* (GM07-2008 Amendment 2). Monitoring frequencies have not been reduced as part of the reduced monitoring frequency evaluation procedures for facilities with exemplary performance established in the VPDES Permit Manual (GM10-2003, Section MN-2, Item 5, Monitoring Reductions for Reissuances).

Comment: DEQ must include seasonal limitations for total phosphorus that are protective of water quality.

See the attached EPA memo dated March 3, 2004 regarding "Annual Permit Limits for Nitrogen and Phosphorus for Permits Designed to Protect Chesapeake Bay and its tidal tributaries from Excess Nutrient Loading under the National Pollutant Discharge Elimination System" as to why seasonal limitations are not appropriate for nutrient parameters. The use of annual average limitations is also consistent with 9 VAC 25-40 *Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed* and considered to be protective of seasonal water quality concerns as discussed in the EPA memorandum.

Comment: The new Total Phosphorus Concentration Limitation Fails to Ensure Compliance with Henrico WRF's Wasteload Allocation.

Response: The total phosphorus wasteload allocations as listed in the Water Quality Management Planning Regulation (9VAC25-720) were calculated based on effluent concentrations of 0.5 mg/L and facility specific design capacities. The difference in the wasteload allocation calculations is due to the precision of the conversion factors used to calculate loadings. The wasteload allocations contained in the Water Quality Management Planning Regulation lists are enforceable annual mass load limits and, the permittee is only permitted to discharge an annual mass load of total phosphorus of 114,209 pounds per year.

Comment: All Total Phosphorus Limitations and Requirements should be Included in Henrico WRF's Individual Permit.

Response: Section §62.1-44.19:14 of the Code of Virginia directed the State Water Control Board to establish a general permit for the discharge of total nitrogen and total phosphorus from point source discharges to the waters of the Chesapeake Bay and its tributaries. That section of the Code also states that the watershed general permit shall control in lieu of conflicting or duplicating requirements. DEQ is obligated to issue permits in accordance with Virginia state law and therefore until such time that the law is changed, nutrient requirements will be covered under both the individual and general permits. Additionally, the individual VPDES permit contains reference to the requirements of the general permit for which the facility is registered so that the permittee is aware of other applicable requirements.

<u>Total Nitrogen</u>

Comment: The Permit should Include Seasonal Monthly Concentration Limitations for Total Nitrogen as well as average weekly and monthly discharge limitations.

Response: The annual limitations for nutrients rather than monthly or weekly average limitations are being applied by DEQ in accordance with the attached EPA Memorandum dated March 3, 2004 regarding "Annual Permit Limits for Nitrogen and Phosphorus for Permits Designed to Protect Chesapeake Bay and its tidal tributaries from Excess Nutrient Loading under the National Pollutant Discharge Elimination System." The use of annual average limitations is also consistent with 9 VAC 25-40 *Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed* and considered to be protective of season water quality concerns as discussed in the EPA Memorandum.

Comment: The New Total Nitrogen Annual Concentration Limitation Fails to Ensure Compliance with Henrico WRF's Wasteload Allocation.

Response: The total nitrogen WLAs as listed in the Water Quality Management Planning Regulation (9VAC25-720) were calculated based on effluent concentrations of 5.0 mg/L and facility specific design capacities. The difference in the wasteload allocation calculations is due to the precision of the conversion factors used to calculate loadings. The wasteload allocations contained in the Water Quality Management Planning Regulation lists are enforceable annual mass load limits and, the permittee is only permitted to discharge an annual mass load of total nitrogen of 1,142,085 pounds per year.

Comment: All Limitations and Requirements for Nitrogen should be Included in Henrico WRF's Individual Permit.

Response: Section §62.1-44.19:14 of the Code of Virginia directed the State Water Control Board to establish a general permit for the discharge of total nitrogen and total phosphorus from point sources. That section of the Code also states that the watershed general permit shall control in lieu of conflicting or duplicating requirements. DEQ is obligated to issue permits in accordance with Virginia state law and therefore until such time that the law is changed, nutrient requirements will be covered under both the individual and general permits. Additionally, the individual VPDES permit contains reference to the requirements of the general permit for which the facility is registered so that the permittee is aware of other applicable requirements.

Ammonia and Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)

Comment: Weekly concentration and mass limitations will not meet the Richmond Crater WQMP.

Response: Weekly concentration and mass limitations for conventional pollutants are calculated based on the EPA evaluation of performance data for POTWs practicing a combination of physical and biological treatment to remove biodegradable organics and suspended solids. As a result of the evaluation, it was concluded that the 7-day (weekly) average achievable concentration for both oxygen demanding substances and suspended solids was 1.5 times the 30-day (monthly) average concentrations as documented in 40 CFR 133, Secondary Treatment Regulation. Using these findings, Virginia's policy on calculating weekly average limitations for conventional pollutants is to multiply the monthly average by 1.5.

Comment: Revision of limitations in accordance with agency's rules of precision results in backsliding

Response: Concentrations have been calculated based on the allocations established in the Richmond Water Quality Management Plan (RWQMP). The limitations in the 2005 permit were not expressed in accordance with DEQ Guidance GM06-2016 and previous guidance memos addressing significant figures. In the 2012 VPDES permit the limitations were revised such that the rules for precision and rounding are appropriately applied. The agency contends that the revised limitations do not constitute backsliding based on the rules of rounding but is a change in how the limitations are expressed. Additionally, the allocations from the RCWQMP have been included in the permit as load limitations and must be met independent of the concentration limitation.

Comment: $cBOD_5$ Monitoring Frequency should not be reduced.

Response: Anti-backsliding statutory provisions in the Clean Water Act Section 402 prohibit the relaxation of *effluent limitations* with some exceptions. A reduction in monitoring frequency does not constitute backsliding. Additionally, monitoring frequencies have not been reduced as part of the reduced monitoring frequency evaluation procedures for facilities with exemplary operations established in the VPDES Permit Manual (GM10-2003, Section MN-2, Item 5, Monitoring Reductions for Reissuances). The monitoring frequency for $cBOD_5$ is based on the VPDES Permit Manual (GM10-2003, Section MN-2, Item 4, Sampling Schedule Table) for plant designs in which ammonia treatment ultimately controls the level of BOD treatment. In the case of the Henrico WRF, total nitrogen control and treatment controls the level of treatment for both ammonia and BOD. Therefore, staff believes it is appropriate to apply a minimum once per week monitoring for $cBOD_5$.

Fecal Coliform/E. coli

Comment: Objection to the reduced monitoring requirements for the new E.coli parameter and recommend that DEQ require at least daily monitoring.

Response: The bacterial monitoring frequency as contained in the permit is established in accordance with the DEQ VPDES Permit Manual (GM10-2003, Section MN-2, Item 4, Sampling Schedule Table). As stated in footnote 8 of the Part I.A.1 limitation table the "4 per Month" monitoring frequency "means four samples, taken at least 7 days apart, in each calendar month." Therefore, weekly bacterial monitoring is required in the permit.

Comments received in 1994 from the Virginia Department of Health were based on problems that were occurring at the plant due to the use of ozone as the method of disinfection, which was installed when the plant commenced operation. In 1994, the facility installed sodium hypochlorite storage and feed units to replace the ozone system, and has successfully been using chlorination for disinfection since that time. Additionally, the chlorine concentration is measured multiple times throughout the day at the chlorine contact tank to ensure a proper bacterial kill is being achieved and effluent quality protected. DEQ has applied the 4 per month bacterial monitoring frequency along with minimum chlorine contact tank limitations and monitoring in accordance with state policy. While the receiving stream segment to which the facility discharges is not designated as public water supply, the City of Hopewell raw water intake is located 8.1 miles downstream of the outfall. The Virginia Department of Health has concurred that the bacterial limitations as applied in the permit are appropriate for the protection of the downstream public water supply. Additionally, while Henrico County is operating under a consent decree for multiple sanitary sewer overflows, these overflows occurred in the aging public works sewer system, and not at the treatment works facility.

Hydrogen Sulfide

Comment: Objection to dissolved sulfide monitoring in lieu of a hydrogen sulfide limitation.

Response: DEQ recently became aware that methods used to calculate concentrations of hydrogen sulfide include the measurement of total sulfide, which is not appropriate in determining if there is a reasonable potential for hydrogen sulfide in effluent to cause or contribute to a violation of the water quality standards. Therefore, DEQ has changed the monitoring requirements from hydrogen sulfide to dissolved sulfide to properly analyze potential concerns. This change in DEQ procedures occurred after monitoring was performed by the permittee but prior to drafting of the permit. In order to properly evaluate the potential impact of hydrogen sulfide from the effluent, dissolved sulfide monitoring data must be collected.

DEQ believes that reissuing the permit with more current limitations, inclusion of nutrient concentration limitations, updated permit language, and dissolved sulfide monitoring is appropriate at this time. The semi-annual dissolved sulfide monitoring requirement will allow DEQ to gather more effluent data and evaluate it for variability during different times of the year. It should be noted that upon review of the semi-annual monitoring data, the permit may be modified or revised at any time to address hydrogen sulfide, or any pollutant, if the agency believes receiving water quality may be in danger of degradation.

Acrylonitrile

Comment: DEQ must either set effluent limitations for acrylonitrile that will protect the human health criteria based on the information available or delay issuance of the permit until it adequate data can be obtained.

Response: The segment of the James River to which this facility discharges is not designated a public water supply. The human health standard for acrylonitrile for the receiving stream is 20 µg/L. As stated in the fact sheet, the facility submitted three laboratory monitoring results for acrylonitrile. On a sample collected June 16, 2009, the permittee reported a concentration of acrylonitrile that was measured as less than the quantification level of 50 µg/L. However, because this value could not show protection of the human health standard, the permittee sampled twice more and reported values of less than 10 µg/L during both sampling events on January 6, 2010 and February 3, 2010. This value is at least 50% less than the human health standard for acrylonitrile. For purposes of DEQ's review and analysis, acrylonitrile is considered absent from the effluent and no further evaluation is necessary.
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IV. Other Issues

Comment: DEQ Should Restore the Previous Industry Survey Deadline or Use Henrico WRF's Suggested Deadline Instead (Part I.D.11 – Pretreatment Program – Industrial User Survey)

Response: Previous agency guidance established the deadline to submit the Pretreatment Program's required Industrial User Survey as "no later than 180 days after the effective of the permit." The owner requested additional time (210-days from permit effective date) to prepare and submit the survey in order to accommodate recent software changes in how the county identifies new industrial users. Staff determined that the 180 day deadline was not based on any statute or regulatory requirement. Additionally, similar comments have been received from other permittees regarding the time it takes to send out the survey and get results back and reported to DEQ. In order to provide flexibility to the permittees and provide them time to perform a thorough review of industrial users, DEQ boilerplate language is being revised to allow all permittees one year to submit the Industrial User Survey.

Comment: DEQ's Response to Our (FOIA) Request Did Not Provide Facility Data Beyond March 2011

Response: It was my understanding that monitoring data from January 1, 2010 through February 2011 was provided in an electronic format and DMR cover letters and monitoring data from March 2011 through February 2012 was provided in hard copy format. Upon learning that you may not have received all of the data requested, all of the monitoring data and cover letters from January 1, 2010 through February 29, 2012 were provided to you as three PDF files by email dated June 5, 2012. Please note that while you may choose to submit additional comments, the comment period for the draft permit ended at 11:59 on June 4, 2012, and those comments will not be considered part of the public record as comments received during the comment period for the reissuance of the Henrico County WRF VPDES permit.

The VPDES discharge permit for the Henrico County WRF has been prepared in accordance with all applicable statutes, regulations and agency practices; the effluent limits and conditions in the permit have been established to protect instream beneficial uses and fish and wildlife resources and to maintain all applicable water quality standards. After consideration of all relevant public comments, this permit will be reissued as proposed with no subsequent changes. The final copy of the VPDES permit will be signed and available no later than June 15, 2012. If you have any questions, please feel free to contact me at 804-527-5015

Sincerely,

Jaime L Bauer

Jaime Bauer
Water Permit Writer

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 3 2004

OFFICE OF
WATER

MEMORANDUM

SUBJECT: **Annual Permit Limits for Nitrogen and Phosphorus for Permits Designed to Protect Chesapeake Bay and its tidal tributaries from Excess Nutrient Loading under the National Pollutant Discharge Elimination System**

FROM: James A. Hanlon, Director
Office of Wastewater Management

TO: Jon Capacasa, Director
Water Permits Division, EPA Region

Rebecca Hanmer, Director
Chesapeake Bay Program Office

This memo responds to your proposal to use National Pollutant Discharge Elimination System (NPDES) permit effluent limits for nitrogen and phosphorus expressed as an annual limit in lieu of daily maximum, weekly average, or monthly average effluent limitations, for the protection of Chesapeake Bay and its tidal tributaries from excess nutrient loading. Based on the information provided by your staff and for the reasons and under the circumstances outlined herein, I concur that permit limits expressed as an annual limit are appropriate and that it is reasonable in this case to conclude that it is "impracticable" to express permit effluent limitations as daily maximum, weekly average, or monthly average effluent limitations. This memo describes the scientific and policy rationales that support this approach.

EPA Region 3 has developed recommended water quality criteria for certain parameters designed to protect water quality in Chesapeake Bay and its tidal tributaries.[1] The main cause of water quality impairment for these parameters in the main stem of the Bay is loading of nutrients, specifically nitrogen and phosphorus, from point and nonpoint sources throughout the entire Chesapeake Bay watershed. The States are in the

[1] See EPA's Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll for the Chesapeake Bay and Its Tidal Tributaries, April 2003. "Chesapeake Bay and its tidal tributaries" is the portion of the Chesapeake Bay watershed subject to the ebb and flow of ocean tides. This area encompasses all of the mainstem Bay and the area north and east to the fall line. The fall line is a physical barrier on the Bay's larger tributaries marked by waterfalls and rapids.

process of adopting revised water quality standards based on EPA Region 3's recommended water quality criteria and developing wasteload allocations for point sources discharging to the Chesapeake Bay watershed that are designed to protect water quality in Chesapeake Bay and its tidal tributaries from excess nutrient loading.

Establishing appropriate permit limits that implement nitrogen and phosphorus wasteload allocations for discharges that cause, have the reasonable potential to cause, or contribute to excursions of water quality criteria for Chesapeake Bay and its tidal tributaries is different from setting limits for other parameters such as toxic pollutants because: the exposure period of concern for nutrients loadings to Chesapeake Bay and its tidal tributaries is very long; the area of concern is far-field (as opposed to the immediate vicinity of the discharge); and the average pollutant load rather than the maximum pollutant load is of concern. Thus, developing appropriate effluent limitations requires innovative implementation procedures.

Applicablility

Your proposal addresses implementation of wasteload allocations for nitrogen and phosphorus designed to achieve compliance with water quality standards of Chesapeake Bay. Your proposal and the rationale discussed in this memorandum are not intended to address wasteload allocations to meet other water quality standards in areas outside of Chesapeake Bay and its tidal tributaries. Smaller scales such as embayments and smaller tributaries than the major Eastern and Western shore rivers were not examined and therefore the rationale in this memorandum does not address and may not apply to the protection of these smaller scale situations.

This rationale also does not apply to parameters other than nitrogen and phosphorus that may exhibit an oxygen demand to waters of the Bay. Such parameters include dissolved oxygen, biochemical oxygen demand, and ammonia.

Of course, all local water quality standards apply and must be met when evaluating appropriate point source permit effluent limits. States are developing water quality standards for nutrients to be applied to local waters as stand-alone criteria. In any case where the nutrient wasteload allocations for protection of water quality in a river, tributary, or other part of Chesapeake Bay are expressed on a shorter term basis, i.e., seasonal, monthly, weekly or daily values, the permit limits that derive from and comply with the wasteload allocation expressed on such shorter term basis must be used. Shorter averaging periods might be appropriate and necessary to protect against local nutrient impacts in rivers or streams in the basin.

Additionally, it is important to note that the nutrient dynamics of the Bay may not be unique. The establishment of an annual limit with a similar finding of "impracticability" pursuant to 40 CFR 122.45(d) may be appropriate for the implementation of nutrient criteria in other watersheds when: attainment of the criteria is dependent on long-term average loadings rather than short-term maximum loadings; the

circumstances match those outlined in this memo for Chesapeake Bay and its tidal tributaries; annual limits are technically supportable with robust data and modeling as they are in the Chesapeake Bay context; and appropriate safeguards to protect all other applicable water quality standards are employed.

Why are annual loadings appropriate for wasteload allocations for nutrients for Chesapeake Bay and its tidal tributaries?

The nutrient dynamics of Chesapeake Bay and its tidal tributaries are complex. Unlike toxics and many conventional pollutants that have a direct and somewhat immediate effect on the aquatic system, nutrients have no direct effect, but instead are "processed" in several discreet steps in the Bay ecosystem before they have their full effect. Each processing "step" further delays and buffers the time between the time of nutrient discharge in an effluent and the resultant nutrient effect on the receiving waterbody.[2] Chesapeake Bay and its tidal tributaries' biological and physical processes can be viewed as "integrating" variations of nutrient load magnitude over time. The integration of nutrient loads from all sources over time ameliorates intraannual load fluctuations from individual sources, with the Bay responding to overall loads on an annual scale, while showing little response to monthly variations within an annual load.[3]

EPA has conducted complex modeling of the effect of nutrient loading to the Bay specifically from individual point source discharges.[4] Based on the results of the model, EPA concluded that Chesapeake Bay and its tidal tributaries in effect integrate variable point source monthly loads over time, so that as long as a particular annual total load of nitrogen and phosphorus is met, constant or variable *intraannual* load variation from individual point sources has no effect on water quality of the main bay.[5]

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[2] More specifically, nutrients are taken up by algae throughout the year, and once taken up, settle to the bottom to decay in the warmer summer waters, contributing to summer anoxia/hypoxia. Thus, summer anoxia is the result of organics, primarily from algal deposition, which accumulates throughout the year, with peak algal biomass generated in the bloom of early spring, and that these organics are stored in Chesapeake Bay and tidal tributary sediments throughout the year and between years.

[3] The seasonal build-up of the volume of hypoxic water in the deep channel results from the integration of effects of microbial metabolism acting over long time scales. With respect to the Chesepeake Bay, Boynton et al. stated "... the coupling between nutrient loading, water column production of organic matter, and recycling of nutrient from sediments occurs over time scales of about several years or less."

[4] The complex movement of water within Chesapeake Bay and its tidal tributaries, particularly the density-driven vertical estuarine stratification, is simulated with a Chesapeake Bay hydrodynamic model of more than 13,000 cells. The Water Quality Model is linked to the hydrodynamic model and uses complex nonlinear equations describing 26 variables of relevance to the simulation of dissolved oxygen, water clarity and chlorophyll *a*. Coupled with the Water Quality Model are simulations of settling organic material into and upon the sediments and its subsequent decay and flux of inorganic nutrients from the sediment, as well as a coupled simulation of underwater Bay grasses in the shallows.

[5] The Water Quality Model was used to examine the differences between a constant monthly load and a variable monthly load, but each at the same annual load levels. For nitrogen, the constant monthly discharge estimate is based on a scenario that assumes the level of point source loads based on a constant 5 mg/l discharge applied against point source flow. The variable load scenario is based on the records of 54 sewage treatment plants (STPs) that discharge to Chesapeake Bay that have complete monthly records. The Total Nitrogen average concentration for each month was calculated and then converted to a concentration

Based on the model, EPA and the affected States are developing "tributary strategies" that will assign wasteload allocations expressed as annual loads for the point source dischargers to the Bay and it tributaries that achieve the water quality standards of Chesapeake Bay and its tidal tributaries.[6]

Why is it impracticable to express limits for nutrients on a daily, weekly or monthly basis?

The NPDES regulations at 40 CFR 122.45(d) require that all permit limits be expressed, unless impracticable, as both average monthly limits and maximum daily limits for all dischargers other than publicly owned treatment works (POTWs), and as average weekly limits and average monthly limits for POTWs.

The Office of Wastewater Mangement cautions that the steady-state statistical procedures described in EPA's *Technical Support Document for Water Quality-based Toxics Control*[7] (TSD) are not applicable or appropriate for developing nutrient limits for the main stem of Chesapeake Bay and its tribal tributaries. Developing permit limits for nutrients affecting Chesapeake Bay and its tidal tributaries is different from setting limits for toxic pollutants because the exposure period of concern for nutrients is longer than one month, and can be up to a few years, and the average exposure rather than the maximum exposure is of concern. The statistical derivation procedure described in the TSD for acute and chronic aquatic life protection is not applicable to exposure periods more than 30 days (see TSD page 105). If the procedures described in the TSD for aquatic life protection (i.e., criteria with 1-day and 4-day averaging periods) were used for developing permit limits for nutrients (with much longer averaging periods), both the maximum daily limit or the average weekly limit (as appropriate) and average monthly limit would be less stringent than the wasteload allocation necessary to protect the criteria. Thus, even if a facility was discharging in compliance with permit limits calculated using these procedures, it would be possible to constantly exceed the wasteload allocation. Such an approach clearly is unacceptable.

The TSD in Section 5.4.4 provides guidance for establishing daily and monthly effluent limits for human health protection based on long term exposure periods. However, this approach is also not appropriate for deriving permit limits for nutrients. This is because this TSD procedure is a steady-state approach that assumes that the

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that would be at the same annual loads as the constant 5 mg/l case, but still preserve the observed monthly variations. Monthly changes in flow were also taken into account. The variation in monthly concentrations varied from a low of 3.76 mg/l in August to a high of 8.46 mg/l in January. The derived monthly variation, equivalent on an annual basis to the constant 5 mg/l monthly loads was applied to all point source dischargers in the Chesapeake Bay watershed. Water quality results of the two scenarios were indistinguishable, no difference was seen in the achievement of Chesapeake Bay water quality criteria. A similar analysis was performed for phosphorus and the same conclusion was reached.

[6] The "tributary strategies" determine appropriate load and wasteload allocation designed to achieve water quality standards for the Chesapeake Bay and its tidal tributaries. The analysis is similar in scope to what EPA would expect in a TMDL.

[7] Document reference EPA/505/2-90-001, March 1991.

distribution of effluent load is constant. However, the efficiency of treatment of nutrients by biological nutrient removal is highly sensitive to ambient temperature and is not effective at lower temperatures. Thus, the effluent loading of nutrients is not constant due to seasonal temperature fluctuations in northern climates. Even a simple steady-state model for permit development such as dividing the annual limit by 12 and establishing that value as the monthly limit is therefore, not appropriate. Such a limit does not account for seasonal fluctuations in effluent loading. To establish appropriate weekly or monthly limitations, due to the effect of temperature on treatment efficiency for nutrients, the permitting authority would need to be able to predict with some accuracy the expected annual temperature over that time frame, which is virtually impossible to do given the normal temperature variability in any given week or month.[8] Because of the effect of temperature on the treatment efficiency and the normal variation in ambient temperature over shorter time periods, it is impracticable to develop appropriate daily, weekly or monthly limits for nutrients that are protective of the wasteload allocation expressed as an annual load.

Thus, we conclude that due to the characteristics of nutrient loading and its effects on the water quality in Chesapeake Bay and its tidal tributaries and because the derivation of *appropriate* daily, weekly or monthly limits is not possible for the reasons described above, that it is therefore "impracticable" to express permit effluent limitations as daily maximum, weekly average, or monthly average effluent limitations.

Recommendations for implementing an annual limit

The permit should state the method for determining compliance with the annual limit. When expressing an effluent limit as an annual value, it is recommended that the permit provide the ability to assess compliance at interim dates.[9]

The frequency of compliance monitoring should also be specified in the permit. The Office of Wastewater Management recommends that the effluent discharge volume should be monitored continuously. Nutrient monitoring should be specified on at least a weekly basis, and the monthly mass load should be summarized based on the total flow during the month and reported as a monthly load.

cc: Water Management Division Directors, Regions 1-10
NPDES Branch Chiefs, Regions 1-10
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[8] For example, the National Weather Service reported that for Baltimore, MD the month of November 2003 was one of the warmest on record, the first three weeks of December 2003 were "decidedly cold," followed by a last 10 days of the month that were "unseasonably warm," however, the annual average temperature for 2003 at the same weather station was within 1°C of the annual norm.

[9] Permit compliance is regularly determined on a monthly basis, and Discharge Monitoring Reports are prepared and submitted on a monthly basis.